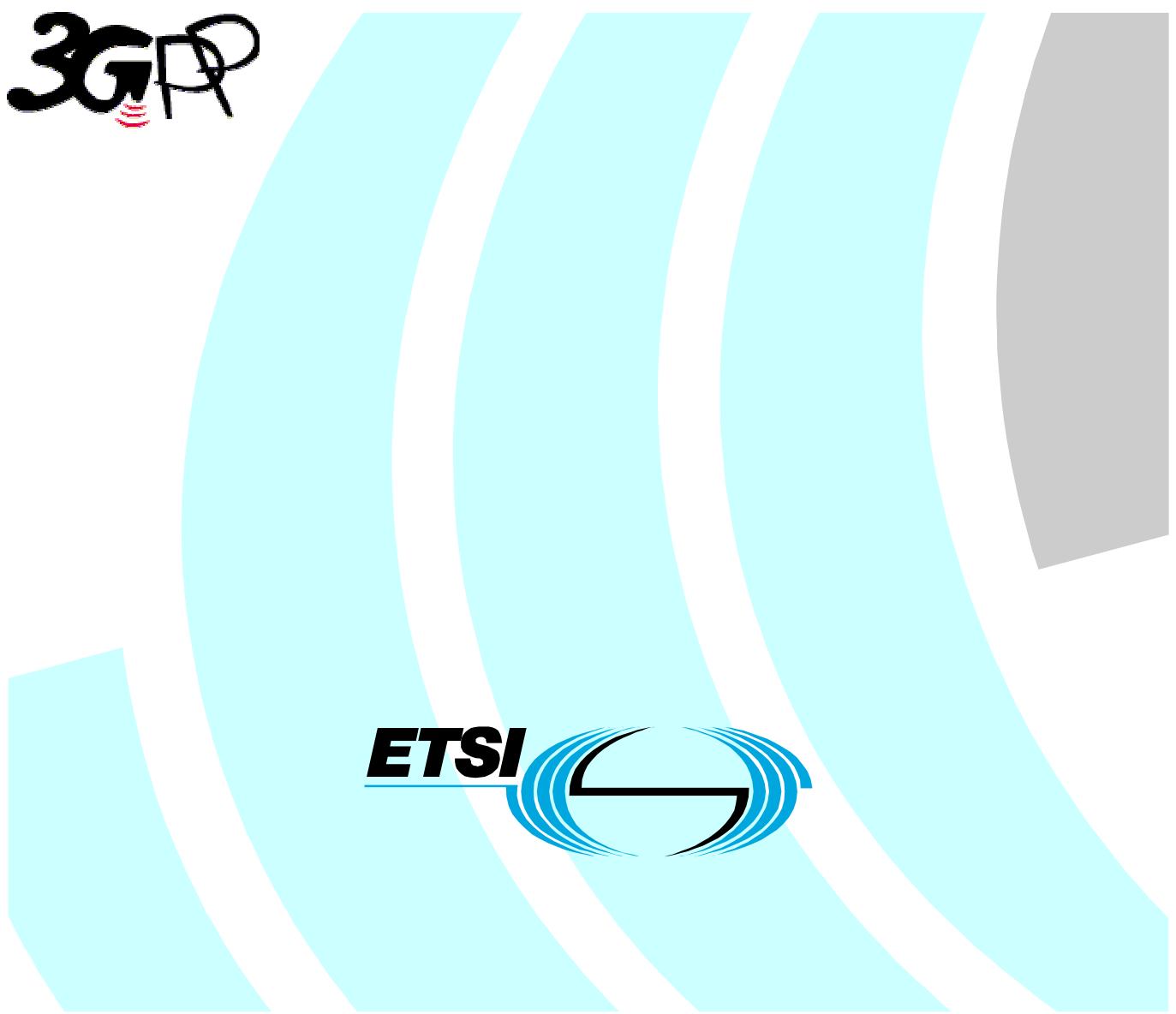


# ETSI TS 125 221 V4.3.0 (2001-12)

*Technical Specification*

**Universal Mobile Telecommunications System (UMTS);  
Physical channels and mapping of transport channels  
onto physical channels (TDD)  
(3GPP TS 25.221 version 4.3.0 Release 4)**



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## Foreword

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## Foreword

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## 1 Scope

The present document describes the characteristics of the physical channels and the mapping of the transport channels to physical channels in the TDD mode of UTRA.

---

## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] 3GPP TS 25.201: "Physical layer - general description".
- [2] 3GPP TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".
- [3] 3GPP TS 25.212: "Multiplexing and channel coding (FDD)".
- [4] 3GPP TS 25.213: "Spreading and modulation (FDD)".
- [5] 3GPP TS 25.214: "Physical layer procedures (FDD)".
- [6] 3GPP TS 25.215: "Physical layer – Measurements (FDD)".
- [7] 3GPP TS 25.222: "Multiplexing and channel coding (TDD)".
- [8] 3GPP TS 25.223: "Spreading and modulation (TDD)".
- [9] 3GPP TS 25.224: "Physical layer procedures (TDD)".
- [10] 3GPP TS 25.225: "Physical layer – Measurements (TDD)".
- [11] 3GPP TS 25.301: "Radio Interface Protocol Architecture".
- [12] 3GPP TS 25.302: "Services Provided by the Physical Layer".
- [13] 3GPP TS 25.401: "UTRAN Overall Description".
- [14] 3GPP TS 25.402: "Synchronisation in UTRAN, Stage 2".
- [15] 3GPP TS 25.304: " UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".
- [16] 3GPP TS 25.427: "UTRAN Iur and Iub interface user plane protocols for DCH data streams".
- [17] 3GPP TS 25.435: "UTRAN I<sub>ub</sub> Interface User Plane Protocols for Common Transport Channel Data Streams".

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### 3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BCH	Broadcast Channel
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CDMA	Code Division Multiple Access
DCH	Dedicated Channel
DL	Downlink
DPCH	Dedicated Physical Channel
DRX	Discontinuous Reception
DSCH	Downlink Shared Channel
DTX	Discontinuous Transmission
DwPCH	Downlink Pilot Channel
DwPTS	Downlink Pilot Time Slot
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FEC	Forward Error Correction
GP	Guard Period
GSM	Global System for Mobile Communication
MIB	Master Information Block
NRT	Non-Real Time
OVSF	Orthogonal Variable Spreading Factor
P-CCPCH	Primary CCPCH
PCH	Paging Channel
PDSCH	Physical Downlink Shared Channel
PI	Paging Indicator (value calculated by higher layers)
PICH	Page Indicator Channel
$P_q$	Paging Indicator (indicator set by physical layer)
PRACH	Physical Random Access Channel
PUSCH	Physical Uplink Shared Channel
RACH	Random Access Channel
RF	Radio Frame
RT	Real Time
S-CCPCH	Secondary CCPCH
SCH	Synchronisation Channel
SCTD	Space Code Transmit Diversity
SF	Spreading Factor
SFN	Cell System Frame Number
TCH	Traffic Channel
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TFI	Transport Format Indicator
TPC	Transmitter Power Control
TrCH	Transport Channel
TSTD	Time Switched Transmit Diversity
TTI	Transmission Time Interval
UE	User Equipment
UL	Uplink
UMTS	Universal Mobil Telecommunications System
UpPTS	Uplink Pilot Time Slot
UpPCH	Uplink Pilot Channel
USCH	Uplink Shared Channel
UTRAN	UMTS Terrestrial Radio Access Network

---

## 4 Services offered to higher layers

### 4.1 Transport channels

Transport channels are the services offered by layer 1 to the higher layers. A transport channel is defined by how and with what characteristics data is transferred over the air interface. A general classification of transport channels is into two groups:

- Dedicated Channels, using inherent addressing of UE
- Common Channels, using explicit addressing of UE if addressing is needed

General concepts about transport channels are described in [12].

#### 4.1.1 Dedicated transport channels

The Dedicated Channel (DCH) is an up- or downlink transport channel that is used to carry user or control information between the UTRAN and a UE.

#### 4.1.2 Common transport channels

There are six types of transport channels: BCH, FACH, PCH, RACH, USCH, DSCH

##### 4.1.2.1 BCH - Broadcast Channel

The Broadcast Channel (BCH) is a downlink transport channel that is used to broadcast system- and cell-specific information.

##### 4.1.2.2 FACH – Forward Access Channel

The Forward Access Channel (FACH) is a downlink transport channel that is used to carry control information to a mobile station when the system knows the location cell of the mobile station. The FACH may also carry short user packets.

##### 4.1.2.3 PCH – Paging Channel

The Paging Channel (PCH) is a downlink transport channel that is used to carry control information to a mobile station when the system does not know the location cell of the mobile station.

##### 4.1.2.4 RACH – Random Access Channel

The Random Access Channel (RACH) is an up link transport channel that is used to carry control information from mobile station. The RACH may also carry short user packets.

##### 4.1.2.5 USCH – Uplink Shared Channel

The uplink shared channel (USCH) is an uplink transport channel shared by several UEs carrying dedicated control or traffic data.

##### 4.1.2.6 DSCH – Downlink Shared Channel

The downlink shared channel (DSCH) is a downlink transport channel shared by several UEs carrying dedicated control or traffic data.

## 4.2 Indicators

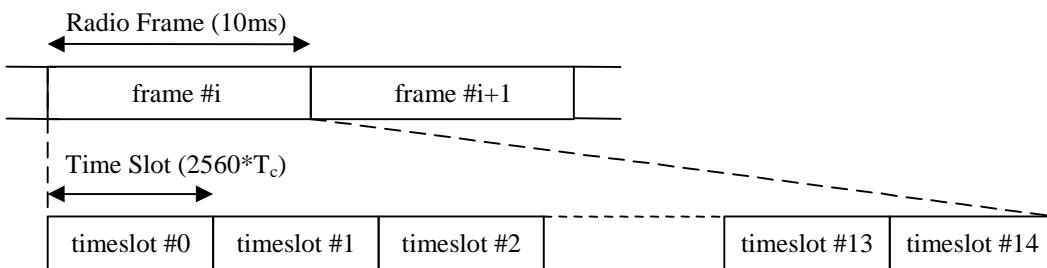
Indicators are means of fast low-level signalling entities which are transmitted without using information blocks sent over transport channels. The meaning of indicators is implicit to the receiver.

The indicator(s) defined in the current version of the specifications are: Paging Indicator.

## 5 Physical channels for the 3.84 Mcps option

All physical channels take three-layer structure with respect to timeslots, radio frames and system frame numbering (SFN), see [14]. Depending on the resource allocation, the configuration of radio frames or timeslots becomes different. All physical channels need a guard period in every timeslot. The time slots are used in the sense of a TDMA component to separate different user signals in the time domain. The physical channel signal format is presented in figure 1.

A physical channel in TDD is a burst, which is transmitted in a particular timeslot within allocated Radio Frames. The allocation can be continuous, i.e. the time slot in every frame is allocated to the physical channel or discontinuous, i.e. the time slot in a subset of all frames is allocated only. A burst is the combination of two data parts, a midamble part and a guard period. The duration of a burst is one time slot. Several bursts can be transmitted at the same time from one transmitter. In this case, the data parts must use different OVSF channelisation codes, but the same scrambling code. The midamble parts are either identically or differently shifted versions of a cell-specific basic midamble code, see section 5.2.3.



**Figure 1: Physical channel signal format**

The data part of the burst is spread with a combination of channelisation code and scrambling code. The channelisation code is a OVSF code, that can have a spreading factor of 1, 2, 4, 8, or 16. The data rate of the physical channel is depending on the used spreading factor of the used OVSF code.

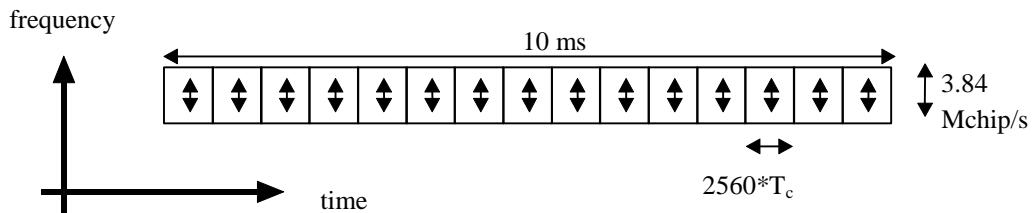
The midamble part of the burst can contain two different types of midambles: a short one of length 256 chips, or a long one of 512 chips. The data rate of the physical channel is depending on the used midamble length.

So a physical channel is defined by frequency, timeslot, channelisation code, burst type and Radio Frame allocation. The scrambling code and the basic midamble code are broadcast and may be constant within a cell. When a physical channel is established, a start frame is given. The physical channels can either be of infinite duration, or a duration for the allocation can be defined.

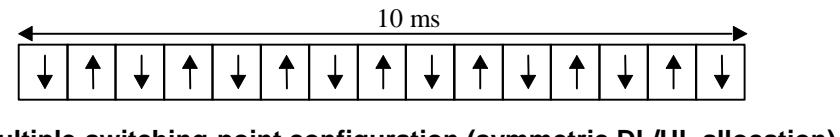
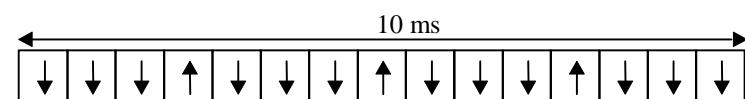
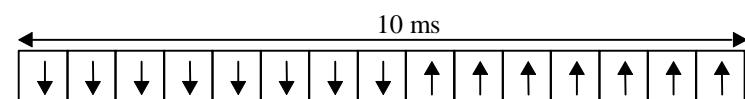
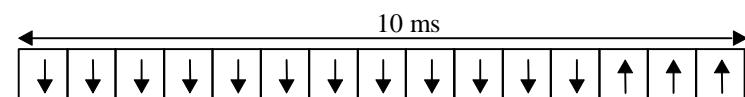
## 5.1 Frame structure

The TDMA frame has a duration of 10 ms and is subdivided into 15 time slots (TS) of  $2560 \cdot T_c$  duration each. A time slot corresponds to 2560 chips. The physical content of the time slots are the bursts of corresponding length as described in subclause 5.2.2.

Each 10 ms frame consists of 15 time slots, each allocated to either the uplink or the downlink (figure 2). With such a flexibility, the TDD mode can be adapted to different environments and deployment scenarios. In any configuration at least one time slot has to be allocated for the downlink and at least one time slot has to be allocated for the uplink.

**Figure 2: The TDD frame structure**

Examples for multiple and single switching point configurations as well as for symmetric and asymmetric UL/DL allocations are given in figure 3.

**Multiple-switching-point configuration (symmetric DL/UL allocation)****Multiple-switching-point configuration (asymmetric DL/UL allocation)****Single-switching-point configuration (symmetric DL/UL allocation)****Single-switching-point configuration (asymmetric DL/UL allocation)****Figure 3: TDD frame structure examples**

## 5.2 Dedicated physical channel (DPCH)

The DCH as described in subclause 4.1.1 is mapped onto the dedicated physical channel.

### 5.2.1 Spreading

Spreading is applied to the data part of the physical channels and consists of two operations. The first is the channelisation operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF). The second operation is the scrambling operation, where a scrambling code is applied to the spread signal. Details on channelisation and scrambling operation can be found in [8].

#### 5.2.1.1 Spreading for Downlink Physical Channels

Downlink physical channels shall use SF =16. Multiple parallel physical channels can be used to support higher data rates. These parallel physical channels shall be transmitted using different channelisation codes, see [8]. These codes with SF =16 are generated as described in [8].

Operation with a single code with spreading factor 1 is possible for the downlink physical channels.

### 5.2.1.2 Spreading for Uplink Physical Channels

The range of spreading factor that may be used for uplink physical channels shall range from 16 down to 1. For each physical channel an individual minimum spreading factor  $SF_{min}$  is transmitted by means of the higher layers. There are two options that are indicated by UTRAN:

1. The UE shall use the spreading factor  $SF_{min}$ , independent of the current TFC.
2. The UE shall autonomously increase the spreading factor depending on the current TFC.

If the UE autonomously changes the SF, it shall always vary the channelisation code along the lower branch of the allowed OVSF sub tree, as depicted in [8].

For multicode transmission a UE shall use a maximum of two physical channels per timeslot simultaneously. These two parallel physical channels shall be transmitted using different channelisation codes, see [8].

### 5.2.2 Burst Types

Three types of bursts for dedicated physical channels are defined. All of them consist of two data symbol fields, a midamble and a guard period, the lengths of which are different for the individual burst types. Thus, the number of data symbols in a burst depends on the SF and the burst type, as depicted in table 1.

**Table 1: Number of data symbols (N) for burst type 1, 2, and 3**

Spreading factor (SF)	Burst Type 1	Burst Type 2	Burst Type 3
1	1952	2208	1856
2	976	1104	928
4	488	552	464
8	244	276	232
16	122	138	116

The support of all three burst types is mandatory for the UE. The three different bursts defined here are well suited for different applications, as described in the following sections.

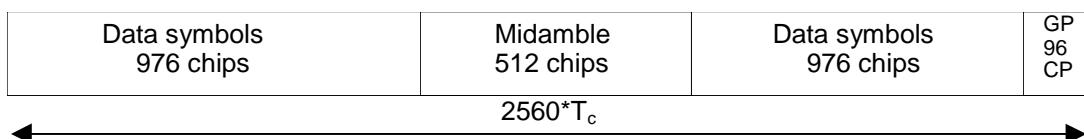
#### 5.2.2.1 Burst Type 1

The burst type 1 can be used for uplink and downlink. Due to its longer midamble field this burst type supports the construction of a larger number of training sequences, see 5.2.3. The maximum number of training sequences depend on the cell configuration, see annex A. For the burst type 1 this number may be 4, 8, or 16.

The data fields of the burst type 1 are 976 chips long. The corresponding number of symbols depends on the spreading factor, as indicated in table 1 above. The midamble of burst type 1 has a length of 512 chips. The guard period for the burst type 1 is 96 chip periods long. The burst type 1 is shown in Figure 4. The contents of the burst fields are described in table 2.

**Table 2: The contents of the burst type 1 fields**

Chip number (CN)	Length of field in chips	Length of field in symbols		Contents of field
0-975	976	Cf table 1		Data symbols
976-1487	512	-		Midamble
1488-2463	976	Cf table 1		Data symbols
2464-2559	96	-		Guard period



**Figure 4: Burst structure of the burst type 1. GP denotes the guard period and CP the chip periods**

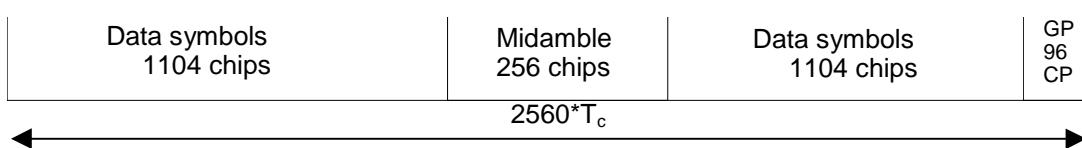
### 5.2.2.2 Burst Type 2

The burst type 2 can be used for uplink and downlink. It offers a longer data field than burst type 1 on the cost of a shorter midamble. Due to the shorter midamble field the burst type 2 supports a maximum number of training sequences of 3 or 6 only, depending on the cell configuration, see annex A.

The data fields of the burst type 2 are 1104 chips long. The corresponding number of symbols depends on the spreading factor, as indicated in table 1 above. The guard period for the burst type 2 is 96 chip periods long. The burst type 2 is shown in Figure 5. The contents of the burst fields are described in table 3.

**Table 3: The contents of the burst type 2 fields**

Chip number (CN)	Length of field in chips	Length of field in symbols		Contents of field
0-1103	1104	cf table 1		Data symbols
1104-1359	256	-		Midamble
1360-2463	1104	cf table 1		Data symbols
2464-2559	96	-		Guard period



**Figure 5: Burst structure of the burst type 2. GP denotes the guard period and CP the chip periods**

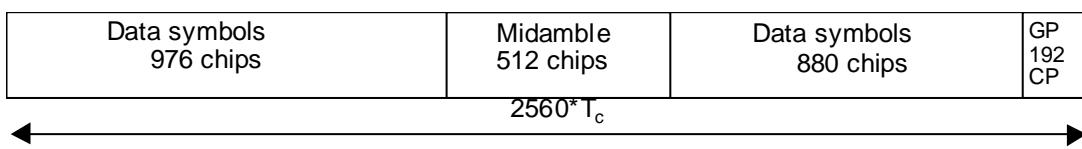
### 5.2.2.3 Burst Type 3

The burst type 3 is used for uplink only. Due to the longer guard period it is suitable for initial access or access to a new cell after handover. It offers the same number of training sequences as burst type 1.

The data fields of the burst type 3 have a length of 976 chips and 880 chips, respectively. The corresponding number of symbols depends on the spreading factor, as indicated in table 1 above. The midamble of burst type 3 has a length of 512 chips. The guard period for the burst type 3 is 192 chip periods long. The burst type 3 is shown in Figure 6. The contents of the burst fields are described in table 4.

**Table 4: The contents of the burst type 3 fields**

Chip number (CN)	Length of field in chips	Length of field in symbols		Contents of field
0-975	976	Cf table 1		Data symbols
976-1487	512	-		Midamble
1488-2367	880	Cf table 1		Data symbols
2368-2559	192	-		Guard period



**Figure 6: Burst structure of the burst type 3. GP denotes the guard period and CP the chip periods**

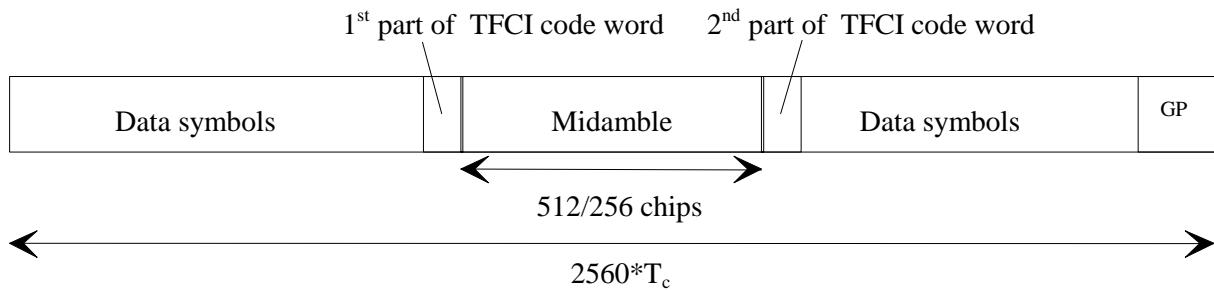
### 5.2.2.4 Transmission of TFCI

All burst types 1, 2 and 3 provide the possibility for transmission of TFCI.

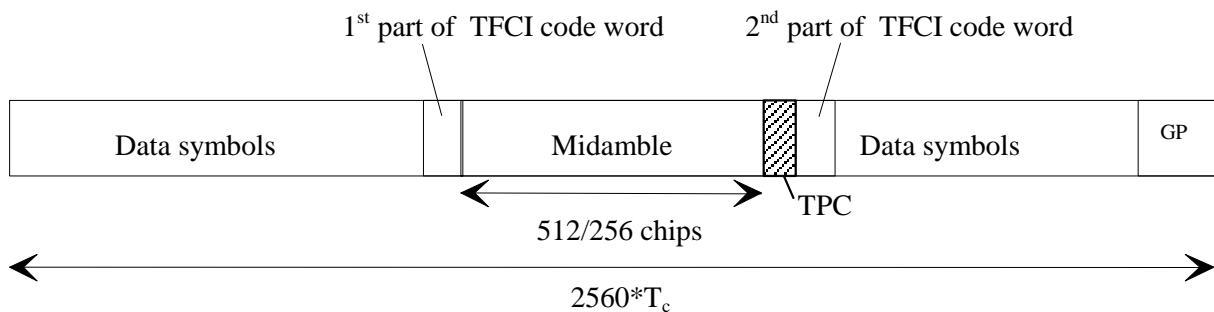
The transmission of TFCI is negotiated at call setup and can be re-negotiated during the call. For each CCTrCH it is indicated by higher layer signalling, which TFCI format is applied. Additionally for each allocated timeslot it is signalled individually whether that timeslot carries the TFCI or not. The TFCI is always present in the first timeslot in a

radio frame for each CCTrCH. If a time slot contains the TFCI, then it is always transmitted using the first allocated channelisation code in the timeslot, according to the order in the higher layer allocation message.

The transmission of TFCI is done in the data parts of the respective physical channel. In DL the TFCI code word bits and data bits are subject to the same spreading procedure as depicted in [8]. In UL, independent of the SF that is applied to the data symbols in the burst, the data in the TFCI field are always spread with SF=16 using the channelisation code in the lowest branch of the allowed OVSF sub tree, as depicted in [8]. Hence the midamble structure and length is not changed. The TFCI code word is to be transmitted directly adjacent to the midamble, possibly after the TPC. Figure 7 shows the position of the TFCI code word in a traffic burst in downlink. Figure 8 shows the position of the TFCI code word in a traffic burst in uplink.

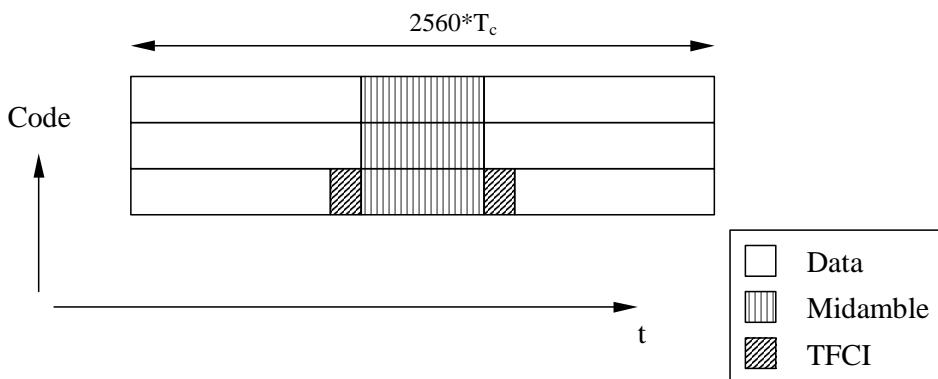


**Figure 7: Position of the TFCI code word in the traffic burst in case of downlink**

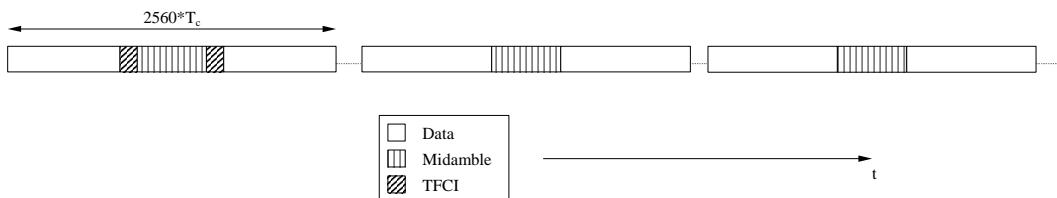


**Figure 8: Position of the TFCI code word in the traffic burst in case of uplink**

Two examples of TFCI transmission in the case of multiple DPCPs used for a connection are given in the Figure 9 and Figure 10 below. Combinations of the two schemes shown are also applicable.



**Figure 9: Example of TFCI transmission with physical channels multiplexed in code domain**



**Figure 10: Example of TFCI transmission with physical channels multiplexed in time domain**

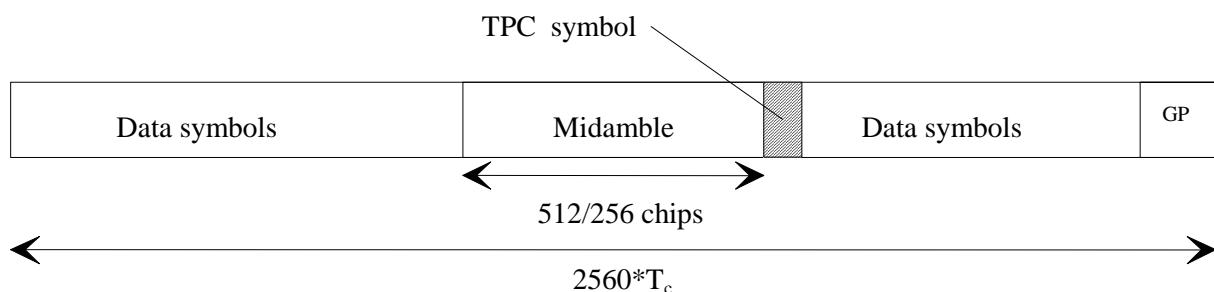
In case the Node B receives an invalid TFI combination on the DCHs mapped to one CCTrCH the procedure described in [16] shall be applied. According to this procedure DTX shall be applied to all DPCCHs to which the CCTrCH is mapped to.

### 5.2.2.5 Transmission of TPC

All burst types 1, 2 and 3 for dedicated channels provide the possibility for transmission of TPC in uplink.

The transmission of TPC is done in the data parts of the traffic burst. Independent of the SF that is applied to the data symbols in the burst, the data in the TPC field are always spread with SF=16 using the channelisation code in the lowest branch of the allowed OVSF sub tree, as depicted in [8]. Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after the midamble. Figure 11 shows the position of the TPC in a traffic burst.

For every user the TPC information shall be transmitted at least once per transmitted frame. If a TFCI is applied for a CCTrCH, TPC shall be transmitted with the same channelization codes and in the same timeslots as the TFCI. If no TFCI is applied for a CCTrCH, TPC shall be transmitted using the first allocated channelisation code and the first allocated timeslot, according to the order in the higher layer allocation message.



**Figure 11: Position of TPC information in the traffic burst**

The length of the TPC command is one symbol. The relationship between the TPC symbol and the TPC command is shown in table 4a.

**Table 4a: TPC bit pattern**

TPC Bits	TPC command	Meaning
00	'Down'	Decrease Tx Power
11	'Up'	Increase Tx Power

### 5.2.2.6 Timeslot formats

#### 5.2.2.6.1 Downlink timeslot formats

The downlink timeslot format depends on the spreading factor, midamble length and on the number of the TFCI code word bits, as depicted in the table 5a.

**Table 5a: Time slot formats for the Downlink**

<b>Slot Format #</b>	<b>Spreading Factor</b>	<b>Midamble length (chips)</b>	<b>N<sub>TFCI</sub> code word (bits)</b>	<b>Bits/slot</b>	<b>N<sub>Data/Slot</sub> (bits)</b>	<b>N<sub>data/data field</sub> (bits)</b>
0	16	512	0	244	244	122
1	16	512	4	244	240	120
2	16	512	8	244	236	118
3	16	512	16	244	228	114
4	16	512	32	244	212	106
5	16	256	0	276	276	138
6	16	256	4	276	272	136
7	16	256	8	276	268	134
8	16	256	16	276	260	130
9	16	256	32	276	244	122
10	1	512	0	3904	3904	1952
11	1	512	4	3904	3900	1950
12	1	512	8	3904	3896	1948
13	1	512	16	3904	3888	1944
14	1	512	32	3904	3872	1936
15	1	256	0	4416	4416	2208
16	1	256	4	4416	4412	2206
17	1	256	8	4416	4408	2204
18	1	256	16	4416	4400	2200
19	1	256	32	4416	4384	2192

### 5.2.2.6.2 Uplink timeslot formats

The uplink timeslot format depends on the spreading factor, midamble length, guard period length and on the number of the TFCI code word bits. Due to TPC, different amount of bits are mapped to the two data fields. The timeslot formats are depicted in the table 5b.

**Table 5b: Timeslot formats for the Uplink**

Slot Format #	Spreading Factor	Midamble length (chips)	Guard Period (chips)	N <sub>TFCI</sub> code word (bits)	N <sub>TPC</sub> (bits)	Bits/slot	N <sub>Data/Slot</sub> (bits)	N <sub>data/data field(1)</sub> (bits)	N <sub>data/data field(2)</sub> (bits)
0	16	512	96	0	0	244	244	122	122
1	16	512	96	0	2	244	242	122	120
2	16	512	96	4	2	244	238	120	118
3	16	512	96	8	2	244	234	118	116
4	16	512	96	16	2	244	226	114	112
5	16	512	96	32	2	244	210	106	104
6	16	256	96	0	0	276	276	138	138
7	16	256	96	0	2	276	274	138	136
8	16	256	96	4	2	276	270	136	134
9	16	256	96	8	2	276	266	134	132
10	16	256	96	16	2	276	258	130	128
11	16	256	96	32	2	276	242	122	120
12	8	512	96	0	0	488	488	244	244
13	8	512	96	0	2	486	484	244	240
14	8	512	96	4	2	482	476	240	236
15	8	512	96	8	2	478	468	236	232
16	8	512	96	16	2	470	452	228	224
17	8	512	96	32	2	454	420	212	208
18	8	256	96	0	0	552	552	276	276
19	8	256	96	0	2	550	548	276	272
20	8	256	96	4	2	546	540	272	268
21	8	256	96	8	2	542	532	268	264
22	8	256	96	16	2	534	516	260	256
23	8	256	96	32	2	518	484	244	240
24	4	512	96	0	0	976	976	488	488
25	4	512	96	0	2	970	968	488	480
26	4	512	96	4	2	958	952	480	472
27	4	512	96	8	2	946	936	472	464
28	4	512	96	16	2	922	904	456	448
29	4	512	96	32	2	874	840	424	416
30	4	256	96	0	0	1104	1104	552	552
31	4	256	96	0	2	1098	1096	552	544
32	4	256	96	4	2	1086	1080	544	536
33	4	256	96	8	2	1074	1064	536	528
34	4	256	96	16	2	1050	1032	520	512
35	4	256	96	32	2	1002	968	488	480
36	2	512	96	0	0	1952	1952	976	976
37	2	512	96	0	2	1938	1936	976	960
38	2	512	96	4	2	1910	1904	960	944
39	2	512	96	8	2	1882	1872	944	928
40	2	512	96	16	2	1826	1808	912	896
41	2	512	96	32	2	1714	1680	848	832
42	2	256	96	0	0	2208	2208	1104	1104
43	2	256	96	0	2	2194	2192	1104	1088
44	2	256	96	4	2	2166	2160	1088	1072
45	2	256	96	8	2	2138	2128	1072	1056
46	2	256	96	16	2	2082	2064	1040	1024
47	2	256	96	32	2	1970	1936	976	960

Slot Format #	Spreading Factor	Midamble length (chips)	Guard Period (chips)	N <sub>TFCI</sub> code word (bits)	N <sub>TPC</sub> (bits)	Bits/slot	N <sub>Data/Slot</sub> (bits)	N <sub>data/data field(1)</sub> (bits)	N <sub>data/data field(2)</sub> (bits)
48	1	512	96	0	0	3904	3904	1952	1952
49	1	512	96	0	2	3874	3872	1952	1920
50	1	512	96	4	2	3814	3808	1920	1888
51	1	512	96	8	2	3754	3744	1888	1856
52	1	512	96	16	2	3634	3616	1824	1792
53	1	512	96	32	2	3394	3360	1696	1664
54	1	256	96	0	0	4416	4416	2208	2208
55	1	256	96	0	2	4386	4384	2208	2176
56	1	256	96	4	2	4326	4320	2176	2144
57	1	256	96	8	2	4266	4256	2144	2112
58	1	256	96	16	2	4146	4128	2080	2048
59	1	256	96	32	2	3906	3872	1952	1920
60	16	512	192	0	0	232	232	122	110
61	16	512	192	0	2	232	230	122	108
62	16	512	192	4	2	232	226	120	106
63	16	512	192	8	2	232	222	118	104
64	16	512	192	16	2	232	214	114	100
65	16	512	192	32	2	232	198	106	92
66	8	512	192	0	0	464	464	244	220
67	8	512	192	0	2	462	460	244	216
68	8	512	192	4	2	458	452	240	212
69	8	512	192	8	2	454	444	236	208
70	8	512	192	16	2	446	428	228	200
71	8	512	192	32	2	430	396	212	184
72	4	512	192	0	0	928	928	488	440
73	4	512	192	0	2	922	920	488	432
74	4	512	192	4	2	910	904	480	424
75	4	512	192	8	2	898	888	472	416
76	4	512	192	16	2	874	856	456	400
77	4	512	192	32	2	826	792	424	368
78	2	512	192	0	0	1856	1856	976	880
79	2	512	192	0	2	1842	1840	976	864
80	2	512	192	4	2	1814	1808	960	848
81	2	512	192	8	2	1786	1776	944	832
82	2	512	192	16	2	1730	1712	912	800
83	2	512	192	32	2	1618	1584	848	736
84	1	512	192	0	0	3712	3712	1952	1760
85	1	512	192	0	2	3682	3680	1952	1728
86	1	512	192	4	2	3622	3616	1920	1696
87	1	512	192	8	2	3562	3552	1888	1664
88	1	512	192	16	2	3442	3424	1824	1600
89	1	512	192	32	2	3202	3168	1696	1472

### 5.2.3 Training sequences for spread bursts

In this subclause, the training sequences for usage as midambles in burst type 1, 2 and 3 (see subclause 5.2.2) are defined. The training sequences, i.e. midambles, of different users active in the same cell and same time slot are cyclically shifted versions of one cell-specific single basic midamble code. The applicable basic midamble codes are

given in Annex A.1 and A.2. As different basic midamble codes are required for different burst formats, the Annex A.1 shows the basic midamble codes  $\mathbf{m}_{PL}$  for burst type 1 and 3, and Annex A.2 shows  $\mathbf{m}_{PS}$  for burst type 2. It should be noted that burst type 2 must not be mixed with burst type 1 or 3 in the same timeslot of one cell.

The basic midamble codes in Annex A.1 and A.2 are listed in hexadecimal notation. The binary form of the basic midamble code shall be derived according to table 6 below.

**Table 6: Mapping of 4 binary elements  $m_i$  on a single hexadecimal digit**

4 binary elements $m_i$	Mapped on hexadecimal digit
-1 -1 -1 -1	0
-1 -1 -1 1	1
-1 -1 1 -1	2
-1 -1 1 1	3
-1 1 -1 -1	4
-1 1 -1 1	5
-1 1 1 -1	6
-1 1 1 1	7
1 -1 -1 -1	8
1 -1 -1 1	9
1 -1 1 -1	A
1 -1 1 1	B
1 1 -1 -1	C
1 1 -1 1	D
1 1 1 -1	E
1 1 1 1	F

For each particular basic midamble code, its binary representation can be written as a vector  $\mathbf{m}_P$ :

$$\mathbf{m}_P = (m_1, m_2, \dots, m_P) \quad (1)$$

According to Annex A.1, the size of this vector  $\mathbf{m}_P$  is  $P=456$  for burst type 1 and 3. Annex A.2 is setting  $P=192$  for burst type 2. As QPSK modulation is used, the training sequences are transformed into a complex form, denoted as the complex vector  $\underline{\mathbf{m}}_P$ :

$$\underline{\mathbf{m}}_P = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_P) \quad (2)$$

The elements  $\underline{m}_i$  of  $\underline{\mathbf{m}}_P$  are derived from elements  $m_i$  of  $\mathbf{m}_P$  using equation (3):

$$\underline{m}_i = (j)^i \cdot m_i \text{ for all } i = 1, \dots, P \quad (3)$$

Hence, the elements  $\underline{m}_i$  of the complex basic midamble code are alternating real and imaginary.

To derive the required training sequences (different shifts), this vector  $\underline{\mathbf{m}}_P$  is periodically extended to the size:

$$i_{\max} = L_m + (K'-1)W + \lfloor P/K \rfloor \quad (4)$$

Notes on equation (4):

- $L_m$ : Midamble length
- $K'$ : Maximum number of different midamble shifts in a cell, when no intermediate shifts are used. This value depends on the midamble length.
- $K$ : Maximum number of different midamble shifts in a cell, when intermediate shifts are used,  $K=2K'$ . This value depends on the midamble length.
- $W$ : Shift between the midambles, when the number of midambles is  $K'$ .

- $\lfloor x \rfloor$  denotes the largest integer smaller or equal to x

Allowed values for  $L_m$ ,  $K'$  and  $W$  are given in Annex A.1 and A.2.

So we obtain a new vector  $\underline{\mathbf{m}}$  containing the periodic basic midamble sequence:

$$\underline{\mathbf{m}} = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_{i_{\max}}) = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_{L_m + (K'-1)W + \lfloor P/K \rfloor}) \quad (5)$$

The first  $P$  elements of this vector  $\underline{\mathbf{m}}$  are the same ones as in vector  $\underline{\mathbf{m}}_P$ , the following elements repeat the beginning:

$$\underline{m}_i = \underline{m}_{i-P} \text{ for the subset } i = (P+1), \dots, i_{\max} \quad (6)$$

Using this periodic basic midamble sequence  $\underline{\mathbf{m}}$  for each shift  $k$  a midamble  $\underline{\mathbf{m}}^{(k)}$  of length  $L_m$  is derived, which can be written as a shift specific vector:

$$\underline{\mathbf{m}}^{(k)} = (\underline{m}_1^{(k)}, \underline{m}_2^{(k)}, \dots, \underline{m}_{L_m}^{(k)}) \quad (7)$$

The  $L_m$  midamble elements  $\underline{m}_i^{(k)}$  are generated for each midamble of the first  $K'$  shifts ( $k = 1, \dots, K'$ ) based on:

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K'-k)W} \text{ with } i = 1, \dots, L_m \text{ and } k = 1, \dots, K' \quad (8)$$

The elements of midambles for the second  $K'$  shifts ( $k = (K'+1), \dots, K = (K'+1), \dots, 2K'$ ) are generated based on a slight modification of this formula introducing intermediate shifts:

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K-k-1)W + \lfloor P/K \rfloor} \text{ with } i = 1, \dots, L_m \text{ and } k = K'+1, \dots, K-1 \quad (9)$$

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K'-1)W + \lfloor P/K \rfloor} \text{ with } i = 1, \dots, L_m \text{ and } k = K \quad (10)$$

The number  $K_{\text{Cell}}$  of midambles that is supported in each cell can be smaller than  $K$ , depending on the cell size and the possible delay spreads, see annex A. The number  $K_{\text{Cell}}$  is signalled by higher layers. The midamble sequences derived according to equations (7) to (10) have complex values and are not subject to channelisation or scrambling process, i.e. the elements  $\underline{m}_i^{(k)}$  represent complex chips for usage in the pulse shaping process at modulation.

The term 'a midamble code set' or 'a midamble code family' denotes  $K$  specific midamble codes  $\underline{\mathbf{m}}^{(k)}$ ;  $k=1, \dots, K$ , based on a single basic midamble code  $\underline{\mathbf{m}}_P$  according to (1).

## 5.2.4 Beamforming

When DL beamforming is used, at least that user to which beamforming is applied and which has a dedicated channel shall get one individual midamble according to subclause 5.2.3, even in DL.

## 5.3 Common physical channels

### 5.3.1 Primary common control physical channel (P-CCPCH)

The BCH as described in subclause 4.1.2 is mapped onto the Primary Common Control Physical Channel (P-CCPCH). The position (time slot / code) of the P-CCPCH is known from the Physical Synchronisation Channel (PSCH), see subclause 5.3.4.

#### 5.3.1.1 P-CCPCH Spreading

The P-CCPCH uses fixed spreading with a spreading factor SF = 16 as described in subclause 5.2.1.1. The P-CCPCH always uses channelisation code  $c_{Q=16}^{(k=1)}$ .

### 5.3.1.2 P-CCPCH Burst Types

The burst type 1 as described in subclause 5.2.2 is used for the P-CCPCH. No TFCI is applied for the P-CCPCH.

### 5.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in subclause 5.2.3 are used for the P-CCPCH. For those timeslots in which the P-CCPCH is transmitted, the midambles  $m^{(1)}$  and  $m^{(2)}$  are reserved for P-CCPCH in order to support Space Code transmit Diversity (SCTD) and the beacon function, see 5.4 and 5.5. The use of midambles depends on whether SCTD is applied to the P-CCPCH:

- If no antenna diversity is applied to P-CCPCH,  $m^{(1)}$  is used and  $m^{(2)}$  is left unused. The maximum number  $K_{Cell}$  of midambles in a cell may be 4, 8 or 16.
- If SCTD antenna diversity is applied to P-CCPCH,  $m^{(1)}$  is used for the first antenna and  $m^{(2)}$  is used for the diversity antenna. The maximum number  $K_{Cell}$  of midambles in a cell may be 8 or 16. The case of 4 midambles is not allowed for SCTD.

## 5.3.2 Secondary common control physical channel (S-CCPCH)

PCH and FACH as described in subclause 4.1.2 are mapped onto one or more secondary common control physical channels (S-CCPCH). In this way the capacity of PCH and FACH can be adapted to the different requirements.

### 5.3.2.1 S-CCPCH Spreading

The S-CCPCH uses fixed spreading with a spreading factor SF = 16 as described in subclause 5.2.1.1.

### 5.3.2.2 S-CCPCH Burst Types

The burst types 1 or 2 as described in subclause 5.2.2 are used for the S-CCPCHs. TFCI may be applied for S-CCPCHs.

### 5.3.2.3 S-CCPCH Training sequences

The training sequences, i.e. midambles, as described in subclause 5.2.3 are used for the S-CCPCH.

## 5.3.3 The physical random access channel (PRACH)

The RACH as described in subclause 4.1.2 is mapped onto one uplink physical random access channel (PRACH).

### 5.3.3.1 PRACH Spreading

The uplink PRACH uses either spreading factor SF=16 or SF=8 as described in subclause 5.2.1.2. The set of admissible spreading codes for use on the PRACH and the associated spreading factors are broadcast on the BCH (within the RACH configuration parameters on the BCH).

### 5.3.3.2 PRACH Burst Type

The UEs send uplink access bursts of type 3 randomly in the PRACH. TFCI and TPC are not applied for the PRACH.

### 5.3.3.3 PRACH Training sequences

The training sequences, i.e. midambles, of different users active in the same time slot are time shifted versions of a single periodic basic code. The basic midamble codes for burst type 3 are shown in Annex A. The necessary time shifts are obtained by choosing either *all*  $k=1,2,3,\dots,K'$  (for cells with small radius) or *uneven*  $k=1,3,5,\dots\leq K'$  (for cells with large radius). Different cells use different periodic basic codes, i.e. different midamble sets.

For cells with large radius additional midambles may be derived from the time-inverted Basic Midamble Sequence. Thus, the second Basic Midamble Code  $m_2$  is the time inverted version of Basic Midamble Code  $m_1$ .

In this way, a joint channel estimation for the channel impulse responses of all active users within one time slot can be performed by a maximum of two cyclic correlations (in cells with small radius, a single cyclic correlator suffices). The different user specific channel impulse response estimates are obtained sequentially in time at the output of the cyclic correlators.

### 5.3.3.4 PRACH timeslot formats

For the PRACH the timeslot format is only spreading factor dependent. The timeslot formats 60 and 66 of table 5b are applicable for the PRACH.

### 5.3.3.5 Association between Training Sequences and Channelisation Codes

For the PRACH there exists a fixed association between the training sequence and the channelisation code. The generic rule to define this association is based on the order of the channelisation codes  $\mathbf{c}_Q^{(k)}$  given by  $k$  and the order of the midambles  $\mathbf{m}_j^{(k)}$  given by  $k$ , firstly, and  $j$ , secondly, with the constraint that the midamble for a spreading factor  $Q$  is the same as in the upper branch for the spreading factor  $2Q$ . The index  $j=1$  or  $2$  indicates whether the original Basic Midamble Sequence ( $j=1$ ) or the time-inverted Basic Midamble Sequence is used ( $j=2$ ).

- For the case that all  $k$  are allowed and only one periodic basic code  $\mathbf{m}_1$  is available for the RACH, the association depicted in figure 12 is straightforward.
- For the case that only odd  $k$  are allowed the principle of the association is shown in figure 13. This association is applied for one and two basic periodic codes.

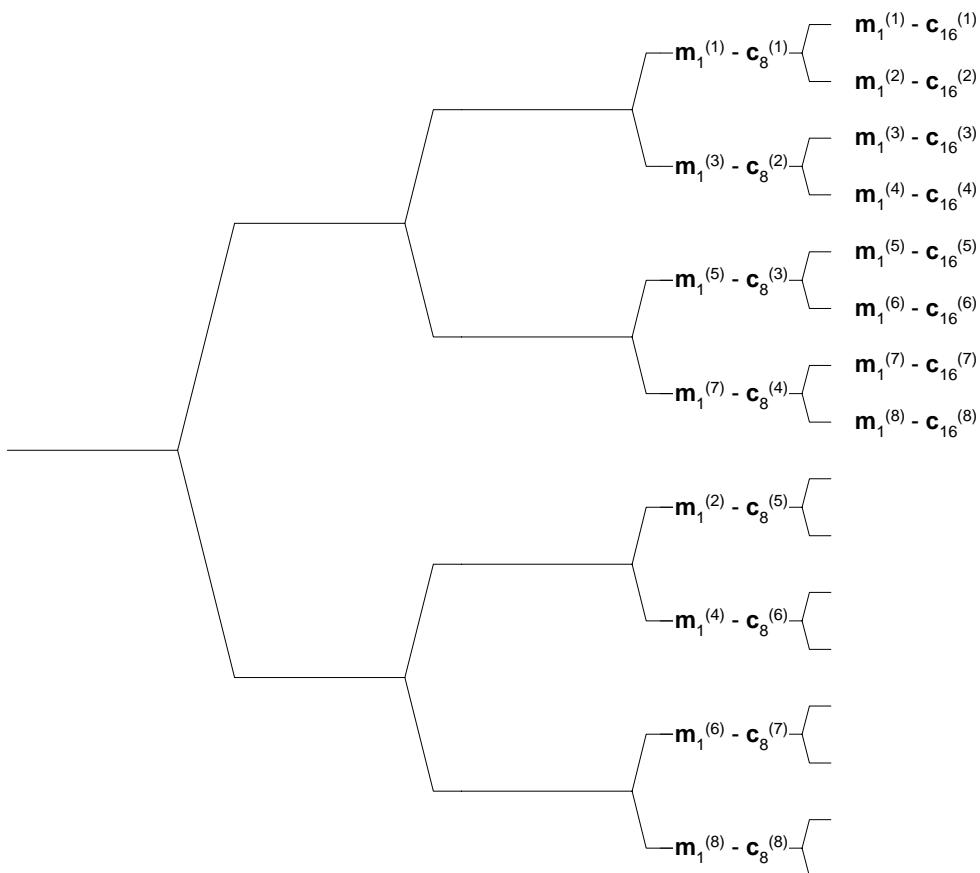
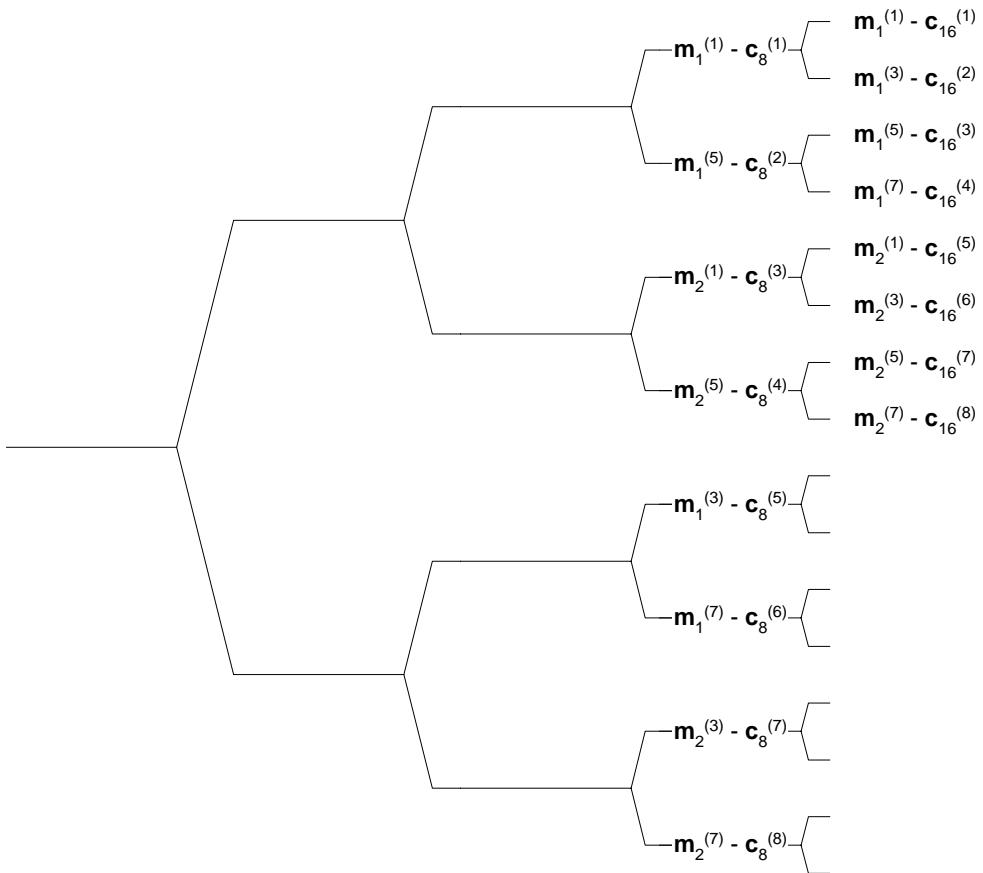


Figure 12: Association of Midambles to Channelisation Codes in the OVSF tree for all  $k$



**Figure 13: Association of Midambles to Channelisation Codes in the OVSF tree for odd  $k$**

### 5.3.4 The synchronisation channel (SCH)

In TDD mode code group of a cell can be derived from the synchronisation channel. In order not to limit the uplink/downlink asymmetry the SCH is mapped on one or two downlink slots per frame only.

There are two cases of SCH and P-CCPCH allocation as follows:

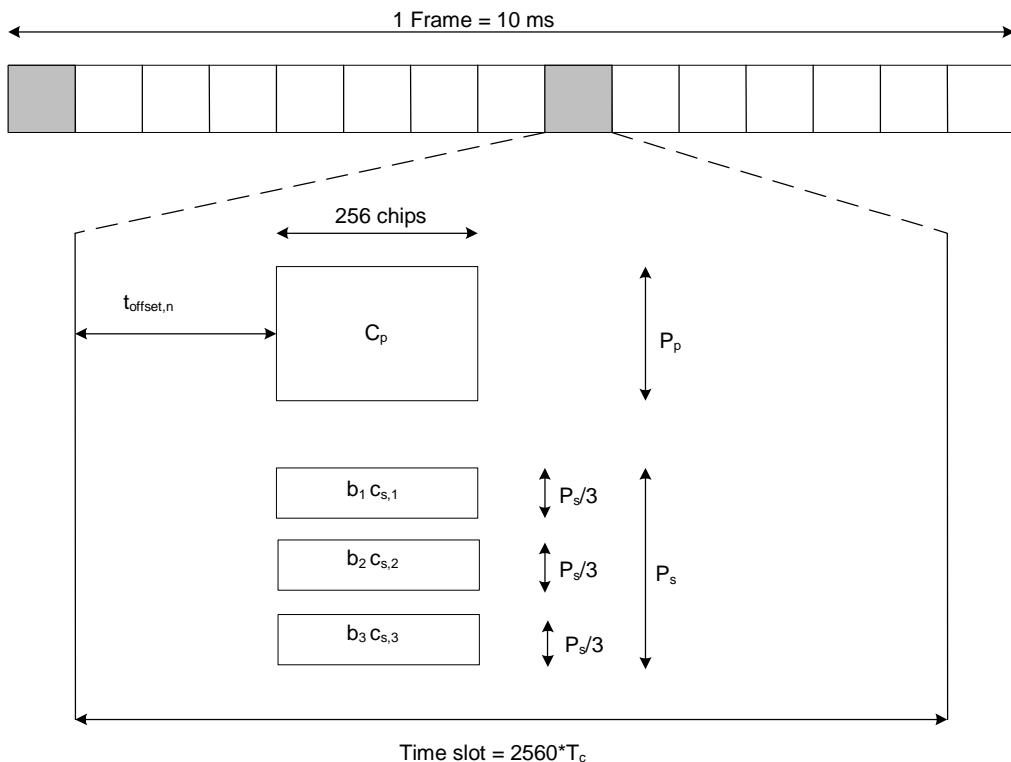
Case 1) SCH and P-CCPCH allocated in TS# $k$ ,  $k=0\dots14$

Case 2) SCH allocated in two TS: TS# $k$  and TS# $k+8$ ,  $k=0\dots6$ ; P-CCPCH allocated in TS# $k$ .

The position of SCH (value of  $k$ ) in frame can change on a long term basis in any case.

Due to this SCH scheme, the position of P-CCPCH is known from the SCH.

Figure 14 is an example for transmission of SCH,  $k=0$ , of Case 2.



$$b_i \in \{\pm 1, \pm j\}, C_{s,i} \in \{C_0, C_1, C_3, C_4, C_5, C_6, C_8, C_{10}, C_{12}, C_{13}, C_{14}, C_{15}\}, i=1,2,3; \text{ see [8]}$$

**Figure 14: Scheme for Synchronisation channel SCH consisting of one primary sequence  $C_p$  and 3 parallel secondary sequences  $C_{s,i}$  in slot k and k+8 (example for k=0 in Case 2)**

As depicted in figure 14, the SCH consists of a primary and three secondary code sequences each 256 chips long. The primary and secondary code sequences are defined in [8] clause 8 'Synchronisation codes for the 3.84 Mcps option'.

Due to mobile to mobile interference, it is mandatory for public TDD systems to keep synchronisation between base stations. As a consequence of this, a capture effect concerning SCH can arise. The time offset  $t_{offset,n}$  enables the system to overcome the capture effect.

The time offset  $t_{offset,n}$  is one of 32 values, depending on the code group of the cell, n, cf. 'table 6 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and  $t_{offset}$ ' in [8]. Note that the cell parameter will change from frame to frame, cf. 'Table 7 Alignment of cell parameter cycling and system frame number' in [8], but the cell will belong to only one code group and thus have one time offset  $t_{offset,n}$ . The exact value for  $t_{offset,n}$ , regarding column 'Associated  $t_{offset}$ ' in table 6 in [8] is given by:

$$t_{offset,n} = \begin{cases} n \cdot 48 \cdot T_c & n < 16 \\ (720 + n \cdot 48)T_c & n \geq 16 \end{cases}; \quad n = 0, \dots, 31$$

### 5.3.5 Physical Uplink Shared Channel (PUSCH)

The USCH as described in subclause 4.1.2 is mapped onto one or more physical uplink shared channels (PUSCH). Timing advance, as described in [9], subclause 4.3, is applied to the PUSCH.

#### 5.3.5.1 PUSCH Spreading

The spreading factors that can be applied to the PUSCH are SF = 1, 2, 4, 8, 16 as described in subclause 5.2.1.2.

### 5.3.5.2 PUSCH Burst Types

Burst types 1, 2 or 3 as described in subclause 5.2.2 can be used for PUSCH. TFCI and TPC can be transmitted on the PUSCH.

### 5.3.5.3 PUSCH Training Sequences

The training sequences as described in subclause 5.2.3 are used for the PUSCH.

### 5.3.5.4 UE Selection

The UE that shall transmit on the PUSCH is selected by higher layer signalling.

## 5.3.6 Physical Downlink Shared Channel (PDSCH)

The DSCH as described in subclause 4.1.2 is mapped onto one or more physical downlink shared channels (PDSCH).

### 5.3.6.1 PDSCH Spreading

The PDSCH uses either spreading factor SF = 16 or SF = 1 as described in subclause 5.2.1.1.

### 5.3.6.2 PDSCH Burst Types

Burst types 1 or 2 as described in subclause 5.2.2 can be used for PDSCH. TFCI can be transmitted on the PDSCH.

### 5.3.6.3 PDSCH Training Sequences

The training sequences as described in subclause 5.2.3 are used for the PDSCH.

### 5.3.6.4 UE Selection

To indicate to the UE that there is data to decode on the DSCH, three signalling methods are available:

- 1) using the TFCI field of the associated channel or PDSCH;
- 2) using on the DSCH user specific midamble derived from the set of midambles used for that cell;
- 3) using higher layer signalling.

When the midamble based method is used, the UE specific midamble allocation method shall be employed (see subclause 5.6), and the UE shall decode the PDSCH if the PDSCH was transmitted with the midamble assigned to the UE by UTRAN. For this method no other physical channels may use the same time slot as the PDSCH and only one UE may share the PDSCH time slot within one TTI.

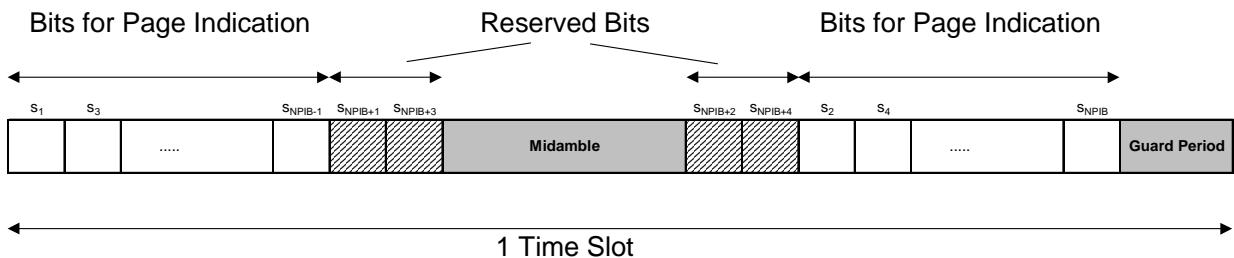
Note: From the above mentioned signalling methods, only the higher layer signalling method is supported by higher layers in Release 4.

## 5.3.7 The Paging Indicator Channel (PICH)

The Paging Indicator Channel (PICH) is a physical channel used to carry the paging indicators.

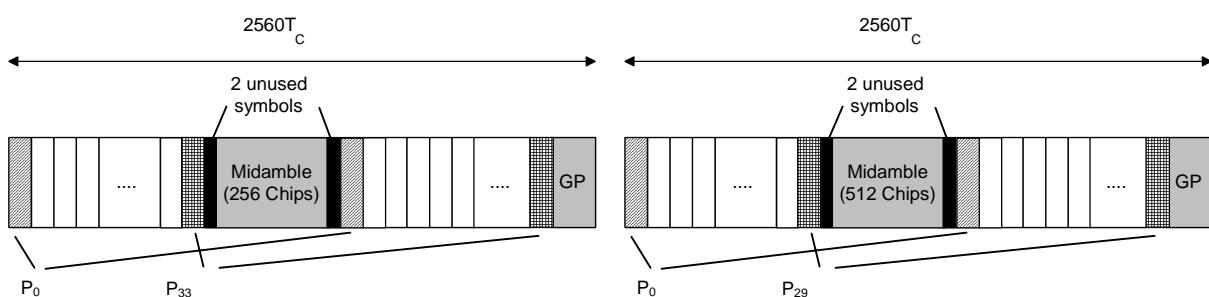
### 5.3.7.1 Mapping of Paging Indicators to the PICH bits

Figure 15 depicts the structure of a PICH burst and the numbering of the bits within the burst. The same burst type is used for the PICH in every cell.  $N_{PIB}$  bits in a normal burst of type 1 or 2 are used to carry the paging indicators, where  $N_{PIB}$  depends on the burst type:  $N_{PIB}=240$  for burst type 1 and  $N_{PIB}=272$  for burst type 2. The bits  $s_{NPIB+1}, \dots, s_{NPIB+4}$  adjacent to the midamble are reserved for possible future use.



**Figure 15: Transmission and numbering of paging indicator carrying bits in a PICH burst**

Each paging indicator  $P_q$  in one time slot is mapped to the bits  $\{s_{2L_{PI}q+1}, \dots, s_{2L_{PI}(q+1)}\}$  within this time slot. Thus, due to the interleaved transmission of the bits half of the symbols used for each paging indicator are transmitted in the first data part, and the other half of the symbols are transmitted in the second data part, as exemplified shown in figure 16 for a paging indicator length  $L_{PI}$  of 4 symbols.



**Figure 16: Example of mapping of paging indicators on PICH bits for  $L_{PI}=4$**

The setting of the paging indicators and the corresponding PICHI bits (including the reserved ones) is described in [7].

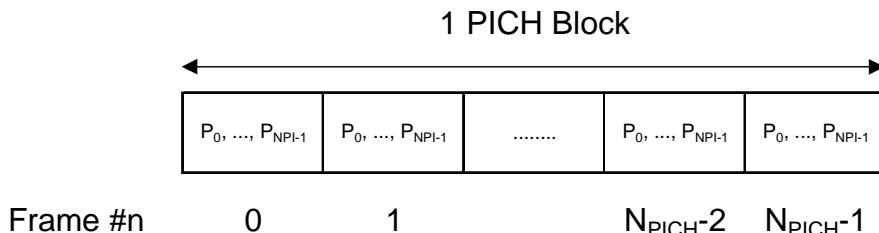
In each radio frame,  $N_{PI}$  paging indicators are transmitted, using  $L_{PI}=2$ ,  $L_{PI}=4$  or  $L_{PI}=8$  symbols. The number of paging indicators  $N_{PI}$  per radio frame is given by the paging indicator length and the burst type, which are both known by higher layer signalling. In table 7 this number is shown for the different possibilities of burst types and paging indicator lengths.

**Table 7: Number  $N_{PI}$  of paging indicators per time slot for the different burst types and paging indicator lengths  $L_{PI}$**

	$L_{PI}=2$	$L_{PI}=4$	$L_{PI}=8$
Burst Type 1	$N_{PI}=60$	$N_{PI}=30$	$N_{PI}=15$
Burst Type 2	$N_{PI}=68$	$N_{PI}=34$	$N_{PI}=17$

### 5.3.7.2 Structure of the PICHI over multiple radio frames

As shown in figure 17, the paging indicators of  $N_{PICHI}$  consecutive frames form a PICHI block,  $N_{PICHI}$  is configured by higher layers. Thus,  $N_p=N_{PICHI} \cdot N_{PI}$  paging indicators are transmitted in each PICHI block.



**Figure 17: Structure of a PICHI block**

The value PI ( $PI = 0, \dots, N_{PI}-1$ ) calculated by higher layers for use for a certain UE, see [15], is associated to the paging indicator  $P_q$  in the nth frame of one PICH block, where q is given by

$$q = PI \bmod N_{PI}$$

and n is given by

$$n = PI \div N_{PI}.$$

The PI bitmap in the PCH data frames over Iub contains indication values for all possible higher layer PI values, see [17]. Each bit in the bitmap indicates if the paging indicator  $P_q$  associated with that particular PI shall be set to 0 or 1. Hence, the calculation in the formulas above is to be performed in Node B to make the association between PI and  $P_q$ .

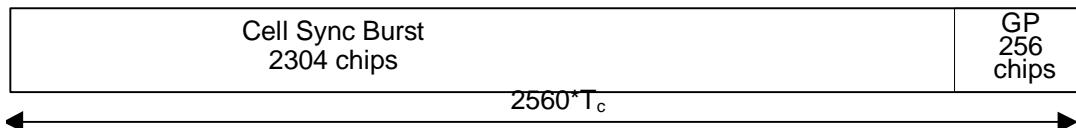
### 5.3.7.3 PICH Training sequences

The training sequences, i.e. midambles for the PICH are generated as described in subclause 5.2.3. The allocation of midambles depends on whether SCTD is applied to the PICH.

- If no antenna diversity is applied the PICH the midambles can be allocated as described in subclause 5.6.
- If SCTD antenna diversity is applied to the PICH the allocation of midambles shall be as described in [9].

### 5.3.8 The physical node B synchronisation channel (PNBSCH)

In case cell sync bursts are used for Node B synchronisation the PNBSCH shall be used for the transmission of the cell sync burst [8]. The PNBSCH shall be mapped on the same timeslot as the PRACH acc. to a higher layer schedule. The cell sync burst shall be transmitted at the beginning of a timeslot. In case of Node B synchronisation via the air interface the transmission of a RACH may be prohibited on higher layer command in specified frames and timeslots.



## 5.4 Transmit Diversity for DL Physical Channels

Table 8 summarizes the different transmit diversity schemes for different downlink physical channel types that are described in [9].

**Table 8: Application of Tx diversity schemes on downlink physical channel types**  
"X" – can be applied, "–" – must not be applied

Physical channel type	Open loop TxDiversity		Closed loop TxDiversity
	TSTD	SCTD	
P-CCPCH	–	X	–
SCH	X	–	–
DPCH	–	–	X
PDSCH	–	–	X
PICH	–	X	–

## 5.5 Beacon characteristics of physical channels

For the purpose of measurements, physical channels at particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The locations of the beacon channels are called beacon locations. The ensemble of beacon channels shall provide the beacon function, i.e. a reference power level at the beacon locations, regularly existing in each radio frame. Thus, beacon channels must be present in each radio frame, the only exception is when idle periods are used to support time difference measurements for location services [9]. Then it may be possible that the beacon channels occur in the

same frame and time slot as the idle periods. In this case, the beacon channels will not be transmitted in that particular frame and time slot.

### 5.5.1 Location of beacon channels

The beacon locations are determined by the SCH and depend on the SCH allocation case, see subclause 5.3.4:

- Case 1) The beacon function shall be provided by the physical channels that are allocated to channelisation code  $c_{Q=16}^{(k=1)}$  and to TS#k, k=0,...,14.
- Case 2) The beacon function shall be provided by the physical channels that are allocated to channelisation code  $c_{Q=16}^{(k=1)}$  and to TS#k and TS#k+8, k=0,...,6.

Note that by this definition the P-CCPCH always has beacon characteristics.

### 5.5.2 Physical characteristics of beacon channels

The beacon channels shall have the following physical characteristics. They:

- are transmitted with reference power;
- are transmitted without beamforming;
- use burst type 1;
- use midamble  $m^{(1)}$  and  $m^{(2)}$  exclusively in this time slot; and
- midambles  $m^{(9)}$  and  $m^{(10)}$  are always left unused in this time slot, if 16 midambles are allowed in that cell.

Note that in the time slot where the P-CCPCH is transmitted only the midambles  $m^{(1)}$  to  $m^{(8)}$  shall be used, see 5.6.1. Thus, midambles  $m^{(9)}$  and  $m^{(10)}$  are always left unused in this time slot.

The reference power corresponds to the sum of the power allocated to both midambles  $m^{(1)}$  and  $m^{(2)}$ . Two possibilities exist:

- If no SCTD antenna diversity is applied to the P-CCPCH and PICH all the reference power of any beacon channel is allocated to  $m^{(1)}$ .
- If SCTD antenna diversity is applied to the P-CCPCH and PICH for any beacon channel midambles  $m^{(1)}$  and  $m^{(2)}$  are each allocated half of the reference power. Midamble  $m^{(1)}$  is used for the first antenna and  $m^{(2)}$  is used for the diversity antenna. SCTD is applied to the P-CCPCH and PICH, see [9]; for all other beacon channels identical spread data sequences are transmitted on both antennas.

## 5.6 Midamble Allocation for Physical Channels

Midambles are part of the physical channel configuration which is performed by higher layers. Three different midamble allocation schemes exist:

- UE specific midamble allocation: A UE specific midamble for DL or UL is explicitly assigned by higher layers.
- Default midamble allocation: The midamble for DL or UL is allocated by layer 1 depending on the associated channelisation code.
- Common midamble allocation: The midamble for the DL is allocated by layer 1 depending on the number of channelisation codes currently being present in the DL time slot.

If a midamble is not explicitly assigned and the use of the common midamble allocation scheme is not signalled by higher layers, the midamble shall be allocated by layer 1, based on the default midamble allocation scheme. This default midamble allocation scheme is given by a fixed association between midambles and channelisation codes, see clause A.3, and shall be applied individually to all channelisation codes within one time slot. Different associations apply for different burst types and cell configurations with respect to the maximum number of midambles.

## 5.6.1 Midamble Allocation for DL Physical Channels

Beacon channels shall always use the reserved midambles  $m^{(1)}$  and  $m^{(2)}$ , see 5.5. For DL physical channels that are located in the same time slot as the P-CCPCH, midambles shall be allocated based on the default midamble allocation scheme, using the association for burst type 1 and  $K_{Cell}=8$  midambles. For all other DL physical channels, the midamble is explicitly assigned by higher layers or allocated by layer 1.

### 5.6.1.1 Midamble Allocation by signalling from higher layers

UE specific midambles may be signalled by higher layers to UE's as a part of the physical channel configuration, if:

- multiple UEs use the physical channels in one DL time slot; and
- beamforming is applied to all of these DL physical channels; and
- no closed loop TxDiversity is applied to any of these DL physical channels;

or

- PDSCH physical layer signalling based on the midamble is used.

### 5.6.1.2 Midamble Allocation by layer 1

#### 5.6.1.2.1 Default midamble

If a midamble is not explicitly assigned and the use of the common midamble allocation scheme is not signalled by higher layers, the UE shall derive the midambles from the allocated channelisation codes and shall use an individual midamble for each channelisation code group containing one primary and a set of secondary channelisation codes. The association between midambles and channelisation code groups is given in annex A.3. All the secondary channelisation codes within a set use the same midamble as the primary channelisation code to which they are associated.

Higher layers shall allocate the channelisation codes in a particular order. Primary channelisation codes shall be allocated prior to associated secondary channelisation codes. If midambles are reserved for the beacon channels, all primary and secondary channelisation codes that are associated with the reserved midambles shall not be used.

Channelisation codes of one channelisation code group shall not be allocated to different UE's.

In the case that secondary channelisation codes are used, secondary channelisation codes of one set shall be allocated in ascending order, with respect to their numbering.

The UE shall assume different channel estimates for each of the individual midambles.

The default midamble allocation shall not apply for those downlink channels that are intended for a UE which will be the only UE assigned to a given time slot or slots for the duration of the assigned channel's existence (as in the case of high rate services).

#### 5.6.1.2.2 Common Midamble

The use of the common midamble allocation scheme is signalled to the UE by higher layers as a part of the physical channel configuration. A common midamble may be assigned by layer 1 to all physical channels in one DL time slot, if:

- a single UE uses all physical channels in one DL time slot (as in the case of high rate service);

or

- multiple UEs use the physical channels in one DL time slot; and
- no beamforming is applied to any of these DL physical channels; and
- no closed loop TxDiversity is applied to any of these DL physical channels; and
- midambles are not used for PDSCH physical layer signalling.

The number of channelisation codes currently employed in the DL time slot is associated with the use of a particular common midamble. Different associations apply for different burst types and cell configurations with respect to the maximum number of midambles, see annex C.

## 5.6.2 Midamble Allocation for UL Physical Channels

If the midamble is explicitly assigned by higher layers, an individual midamble shall be assigned to all UE's in one UL time slot.

If no midamble is explicitly assigned by higher layers, the UE shall derive the midamble from the channelisation code that is used for the data part (except for TFCI/TPC) of the burst. The associations between midamble and channelisation code are the same as for DL physical channels.

## 5.7 Midamble Transmit Power

There shall be no offset between the sum of the powers allocated to all midambles in a timeslot and the sum of the powers allocated to the data symbol fields. The transmit power within a timeslot is hence constant.

The midamble transmit power of beacon channels is equal to the reference power. If SCTD is used for the P-CCPCH, the reference power is equally divided between the midambles  $m^{(1)}$  and  $m^{(2)}$ .

The midamble transmit power of all other physical channels depends on the midamble allocation scheme used. The following rules apply

- In case of Default Midamble Allocation, every midamble is transmitted with the same power as the associated codes.
- In case of Common Midamble Allocation in the downlink, the transmit power of this common midamble is such that there is no power offset between the data parts and the midamble part of the overall transmit signal within one time slot.
- In case of UE Specific Midamble Allocation, the transmit power of the UE specific midamble is such that there is no power offset between the data parts and the midamble part of every user within one time slot.

The following figure 18 depicts the midamble powers for the different channel types and midamble allocation schemes.

Note 1: In figure 18, the codes c(1) to c(16) represent the set of usable codes and not the set of used codes.

Note 2: The common midamble allocation and the midamble allocation by higher layers are not applicable in those beacon time slots, in which the P-CCPCH is located, see section 5.6.1.

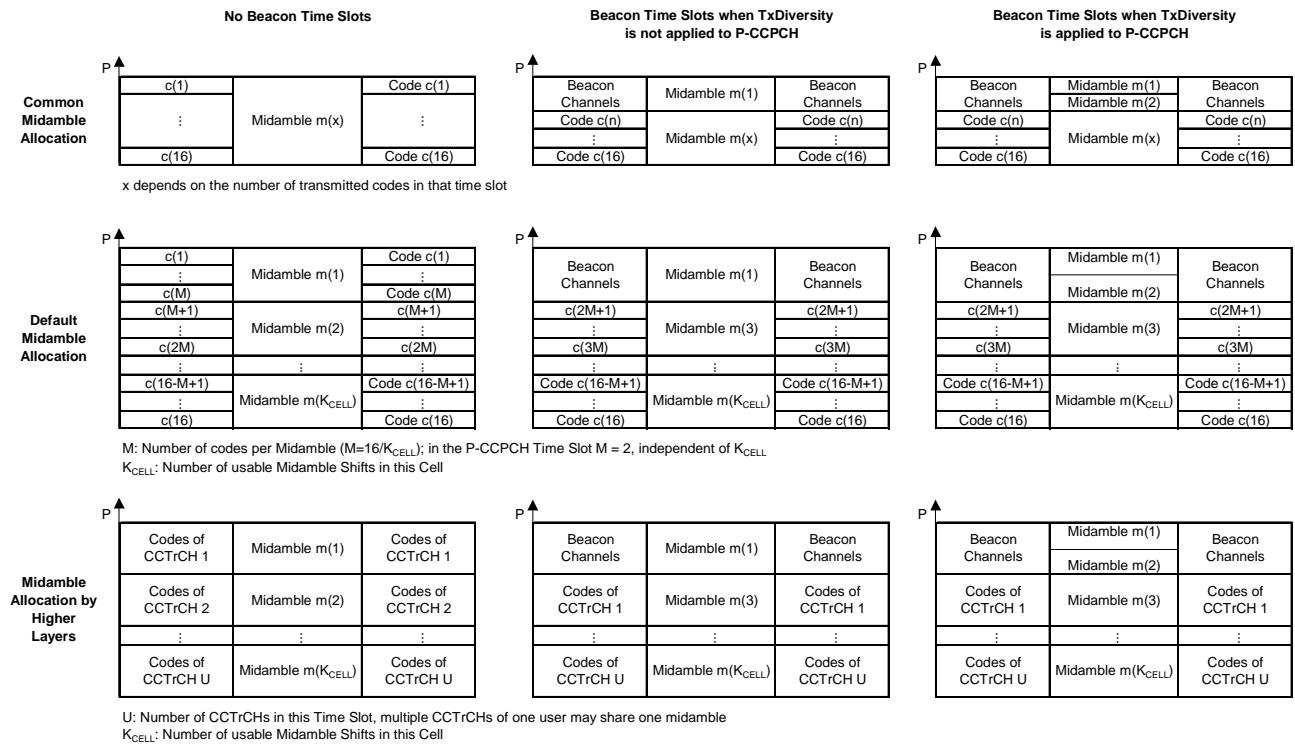
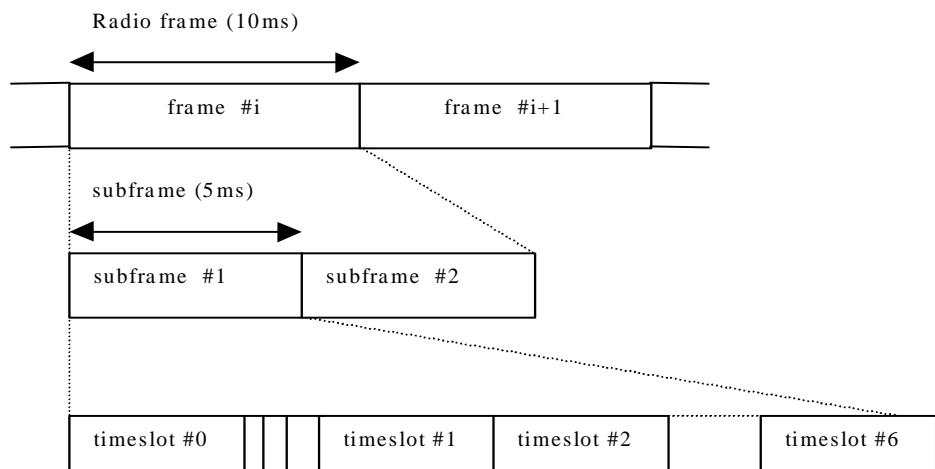


Figure 18: Midamble powers for the different midamble allocation schemes

## 6 Physical channels for the 1.28 Mcps option

All physical channels take three-layer structure with respect to timeslots, radio frames and system frame numbering (SFN), see [14]. Depending on the resource allocation, the configuration of radio frames or timeslots becomes different. All physical channels need guard symbols in every timeslot. The time slots are used in the sense of a TDMA component to separate different user signals in the time and the code domain. The physical channel signal format for 1.28Mcps TDD is presented in figure 19.

A physical channel in TDD is a burst, which is transmitted in a particular timeslot within allocated Radio Frames. The allocation can be continuous, i.e. the time slot in every frame is allocated to the physical channel or discontinuous, i.e. the time slot in a subset of all frames is allocated only. A burst is the combination of a data part, a midamble and a guard period. The duration of a burst is one time slot. Several bursts can be transmitted at the same time from one transmitter. In this case, the data part must use different OVSF channelisation codes, but the same scrambling code. The midamble part has to use the same basic midamble code, but can use different midambles.



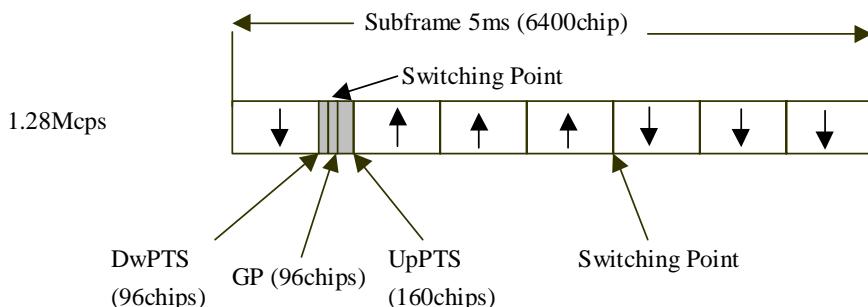
**Figure 19: Physical channel signal format for 1.28Mcps TDD option**

The data part of the burst is spread with a combination of channelisation code and scrambling code. The channelisation code is a OVSF code, that can have a spreading factor of 1, 2, 4, 8, or 16. The data rate of the physical channel is depending on the used spreading factor of the used OVSF code.

So a physical channel is defined by frequency, timeslot, channelisation code, burst type and Radio Frame allocation. The scrambling code and the basic midamble code are broadcast and may be constant within a cell. When a physical channel is established, a start frame is given. The physical channels can either be of infinite duration, or a duration for the allocation can be defined.

## 6.1 Frame structure

The TDMA frame has a duration of 10 ms and is divided into 2 sub-frames of 5ms. The frame structure for each sub-frame in the 10ms frame length is the same.

**Figure 20: Structure of the sub-frame for 1.28Mcps TDD option**

Time slot#n (n from 0 to 6): the n<sup>th</sup> traffic time slot, 864 chips duration;

DwPTS: downlink pilot time slot, 96 chips duration;

UpPTS: uplink pilot time slot, 160 chips duration;

GP: main guard period for TDD operation, 96 chips duration;

In Figure 20, the total number of traffic time slots for uplink and downlink is 7, and the length for each traffic time slot is 864 chips duration. Among the 7 traffic time slots, time slot#0 is always allocated as downlink while time slot#1 is always allocated as uplink. The time slots for the uplink and the downlink are separated by switching points. Between the downlink time slots and uplink time slots, the special period is the switching point to separate the uplink and downlink. In each sub-frame of 5ms for 1.28Mcps option, there are two switching points (uplink to downlink and vice versa).

Using the above frame structure, the 1.28Mcps TDD option can operate on both symmetric and asymmetric mode by properly configuring the number of downlink and uplink time slots. In any configuration at least one time slot (time slot#0) has to be allocated for the downlink and at least one time slot has to be allocated for the uplink (time slot#1).

Examples for symmetric and asymmetric UL/DL allocations are given in figure 21.

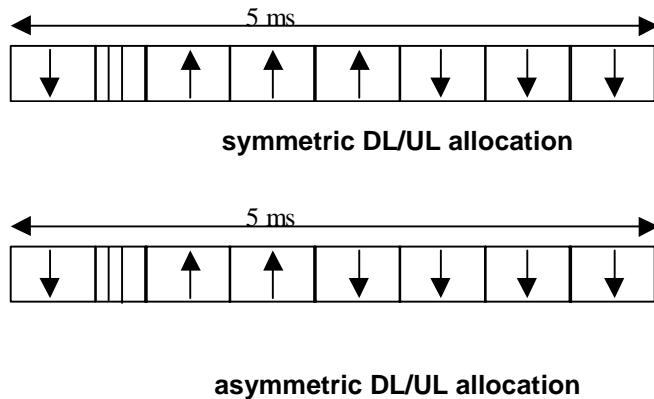


Figure 21: 1.28Mcps TDD sub-frame structure examples

## 6.2 Dedicated physical channel (DPCH)

The DCH as described in subclause 4.1 'Dedicated transport channels' is mapped onto the dedicated physical channel.

### 6.2.1 Spreading

The spreading of physical channels is the same as in 3.84 Mcps TDD (cf. 5.2.1 'Spreading').

### 6.2.2 Burst Format

A traffic burst consists of two data symbol fields, a midamble of 144 chips and a guard period. The data fields of the burst are 352 chips long. The corresponding number of symbols depends on the spreading factor, as indicated in table 9 below. The guard period is 16 chip periods long.

The burst format is shown in Figure 22. The contents of the traffic burst fields is described in table 10.

Table 9: number of symbols per data field in a traffic burst

Spreading factor (Q)	Number of symbols (N) per data field in Burst
1	352
2	176
4	88
8	44
16	22

Table 10: The contents of the traffic burst format fields

Chip number (CN)	Length of field in chips	Length of field in symbols	Contents of field
0-351	352	cf table 9	Data symbols
352-495	144	-	Midamble
496-847	352	cf table 9	Data symbols
848-863	16	-	Guard period

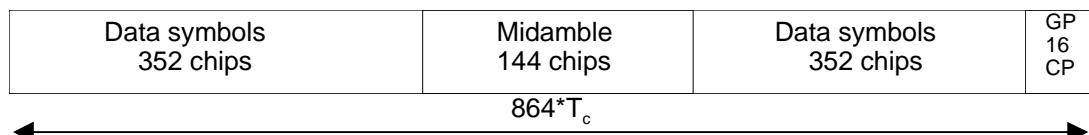


Figure 22: Burst structure of the traffic burst format (GP denotes the guard period and CP the chip periods)

### 6.2.2.1 Transmission of TFCI

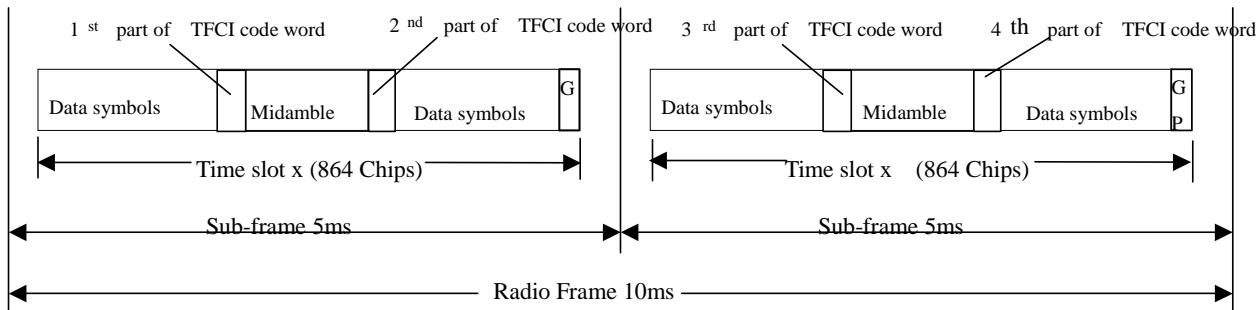
The traffic burst format provides the possibility for transmission of TFCI in uplink and downlink.

The transmission of TFCI is configured by higher Layers. For each CCTrCH it is indicated by higher layer signalling, which TFCI format is applied. Additionally for each allocated timeslot it is signalled individually whether that timeslot carries the TFCI or not. If a time slot contains the TFCI, then it is always transmitted using the first allocated channelisation code in the timeslot, according to the order in the higher layer allocation message.

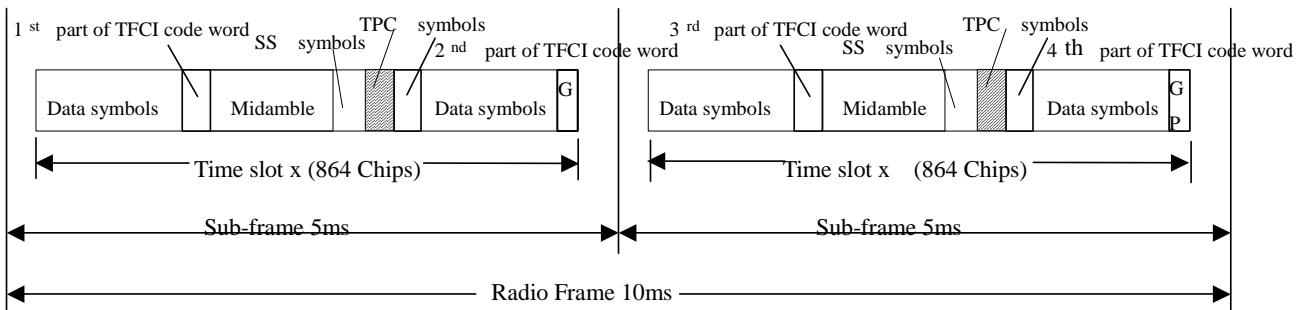
The transmission of TFCI is done in the data parts of the respective physical channel, this means that TFCI code word bits and data bits are subject to the same spreading procedure as depicted in [8]. Hence the midamble structure and length is not changed.

The TFCI code word bits are equally distributed between the two subframes and the respective data fields. The TFCI code word is to be transmitted possibly either directly adjacent to the midamble or after the SS and TPC symbols.

Figure 23 shows the position of the TFCI code word in a traffic burst, if neither SS nor TPC are transmitted. Figure 24 shows the position of the TFCI code word in a traffic burst, if SS and TPC are transmitted.



**Figure 23: Position of the TFCI code word in the traffic burst in case of no TPC and SS in 1.28 Mcps TDD**



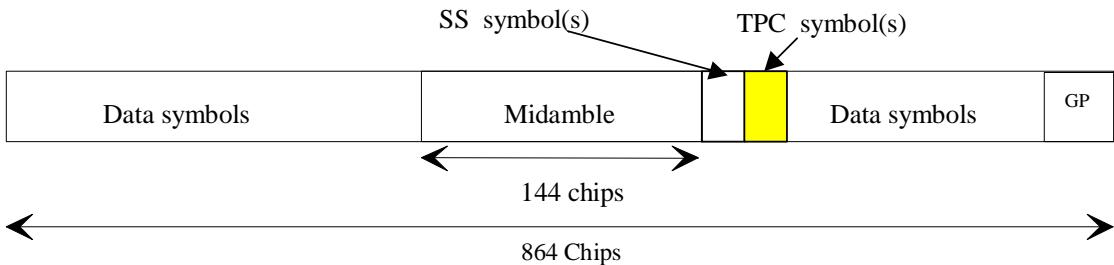
**Figure 24:Position of the TFCI code word in the traffic burst in case of TPC and SS in 1.28 Mcps TDD**

### 6.2.2.2 Transmission of TPC

The burst type for dedicated channels provides the possibility for transmission of TPC in uplink and downlink.

The transmission of TPC is done in the data parts of the traffic burst. Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after the SS information, which is transmitted after the midamble. Figure 25 shows the position of the TPC command in a traffic burst.

For every user the TPC information is to be transmitted at least once per 5ms sub-frame. If applied, transmission of TPC is done in the data parts of the traffic burst and it can be transmitted using the first allocated channelisation code and the first allocated timeslot (according to the order in the higher layer allocation message). Other allocations (more than one TPC transmission in one sub-frame) of TPC are also possible. The TPC is spread with the same spreading factor (SF) and spreading code as the data parts of the respective physical channel.



**Figure 25: Position of TPC information in the traffic burst in downlink and uplink**

For the number of layer 1 symbols per channelisation code there are 3 possibilities for each channelisation code, configured by higher layers:

- 1) one SS and one TPC symbol
- 2) no SS and no TPC symbols
- 3) 16/SF SS and 16/SF TPC symbols

So, in case 3), when SF=1, there are 16 TPC symbols which correspond to 32 bits (for QPSK) and 48 bits (for 8PSK).

In the following the uplink is described only. For the description of the downlink, downlink (DL) and uplink (UL) have to be interchanged.

Each of the TPC symbols for uplink power control in the DL will be associated with an UL time slot and an UL CCTrCH pair. This association varies with

- the number of allocated UL time slots and UL CCTrCHs on these time slots (time slot and CCTrCH pair) and
- the allocated TPC symbols in the DL.

In case a UE has

- more than one channelisation code

and/or

- channelisation codes being of lower spreading factor than 16 and using 16/SF SS and 16/SF TPC symbols,

the TPC commands for each ULtime slot CCTrCH pair (all channelisation codes on that time slot belonging to the same time slot and CCTrCH pair have the same TPC command) will be distributed to the following rules:

1. The ULtime slots and CCTrCH pairs the TPC commands are intended for will be numbered from the first to the last ULtime slot and CCTrCH pair allocated to the regarded UE (starting with 0). The number of a time slot and CCTrCH pair is smaller then the number of another time slot and CCTrCH pair within the same time slot if its spreading code with the lowest SC number according to the following table has a lower SC number then the spreading code with the lowest SC number of the other time slot and CCTrCH pair.
2. The commanding TPC symbols on all DL CCTrCHs allocated to one UE are numbered consecutively starting with zero according to the following rules:
  - a) The numbers of the TPC commands of a regarded DL time slot are lower than those of DL time slots being transmitted after that time slot
  - b) Within a DL time slot the numbers of the TPC commands of a regarded channelisation code are lower than those of channelisation codes having a higher spreading code number

The spreading code number is defined by the following table (see[8]):

SC number	SF (Q)	Walsh code number (k)
0	16	$\mathbf{c}_{Q=16}^{(k=1)}$
	...	
15	16	$\mathbf{c}_{Q=16}^{(k=16)}$
16	8	$\mathbf{c}_{Q=8}^{(k=1)}$
	...	
23	8	$\mathbf{c}_{Q=8}^{(k=8)}$
24	4	$\mathbf{c}_{Q=4}^{(k=1)}$
	...	
27	4	$\mathbf{c}_{Q=4}^{(k=4)}$
28	2	$\mathbf{c}_{Q=2}^{(k=1)}$
29	2	$\mathbf{c}_{Q=2}^{(k=2)}$
30	1	$\mathbf{c}_{Q=1}^{(k=1)}$

Note: Spreading factors 2-8 are not used in DL

- c) Within a channelisation code numbers of the TPC commands are lower than those of TPC commands being transmitted after that time

The following equation is used to determine the UL time slot which is controlled by the regarded TPC symbol in the DL:

$$UL_{pos} = (SFN' \cdot N_{UL\_TPCsymbols} + TPC_{DLpos}) \bmod (N_{ULslot}),$$

where

$UL_{pos}$  is the number of the controlled uplink time slot and CCTrCH pairs.

$SFN'$  is the system frame number counting the sub-frames. The system frame number of the radio frames (SFN) can be derived from  $SFN'$  by

$SFN = SFN' \text{ div } 2$ , where div is the remainder free division operation.

$N_{UL\_PCsymbols}$  is the number of UL TPC symbols in a sub-frame.

$TPC_{DLpos}$  is the number of the regarded UL TPC symbol in the DL within the sub-frame.

$N_{ULslot}$  is the number of UL slots and CCTrCH pairs in a frame.

In Annex G two examples of the association of TPC commands to time slots and CCTrCH pairs are shown.

Coding of TPC:

The relationship between the TPC Bits and the transmitter power control command for QPSK is the same as in the 3.84Mcps TDD cf. [5.2.2.5 ‘Transmission of TPC’].

The relationship between the TPC Bits and the transmitter power control command for 8PSK is given in table 11

**Table 11: TPC Bit Pattern for 8PSK**

TPC Bits	TPC command	Meaning
000	'Down'	Decrease Tx Power
110	'Up'	Increase Tx Power

### 6.2.2.3 Transmission of SS

The burst type for dedicated channels provides the possibility for transmission of uplink synchronisation control (ULSC).

The transmission of ULSC is done in the data parts of the traffic burst. Hence the midamble structure and length is not changed. The ULSC information is to be transmitted directly after the midamble. Figure 26 shows the position of the SS command in a traffic burst.

For every user the ULSC information shall be transmitted at least once per transmitted sub-frame. By default the following rules apply:

1. If a TFCI is applied for a CCTrCH, the SS command(s) shall be transmitted using the same channelisation code and the same timeslots as the TFCI.
2. If no TFCI is applied for a CCTrCH, the SS command(s) shall be transmitted using the first allocated channelisation code and the first allocated timeslot, according to the order in the higher layer allocation message.

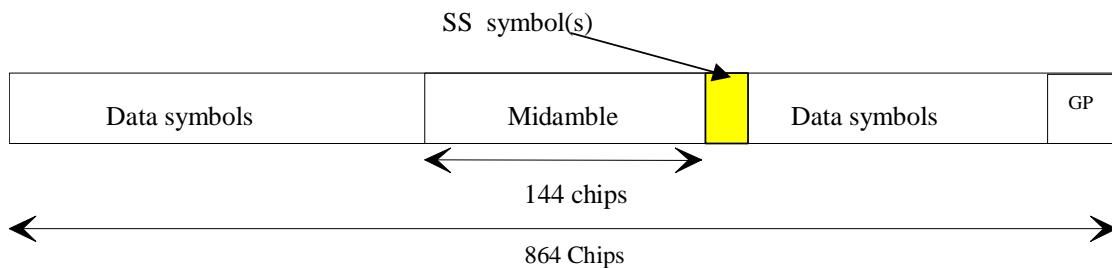
Apart from the default rules other allocations of SS commands are possible according higher layer signalling – e.g. the transmission of more than one SS command (on more than one time slot).

The SS command is spread with the same spreading factor (SF) and spreading code as the data parts of the respective physical channel.

The SS is utilised to command a timing adjustment by  $(k/8) T_c$  each M sub-frames, where  $T_c$  is the chip period. The k and M values are signalled by the network. The SS, as one of L1 signals, is to be transmitted once per 5ms sub-frame.

M (1-8) and k (1-8) can be adjusted during call setup or readjusted during the call.

Note: The smallest step for the SS signalled by the UTRAN is  $1/8 T_c$ . For the UE capabilities regarding the SS adjustment of the UE it is suggested to set the tolerance for the executed command to be  $[1/9; 1/7] T_c$ .

**Figure 26: Position of ULSC information in the traffic burst (downlink and uplink)**

Note that for the uplink where there is no SS symbol used, the SS symbol space is reserved for future use. This can keep UL and DL slots the same structure.

For the number of layer 1 symbols there are 3 possibilities configurable for each channelisation code during the call setup:

- one SS symbol
- no SS symbol
- 16/SF SS symbols

So, in case 3, when SF=1, there are 16 SS symbols which correspond to 32 bits (for QPSK) and 48 bits (for 8PSK).

Each of the SS symbols in the DL will be associated with an UL time slot depending on the allocated UL time slots and the allocated SS symbols in the DL.

Note: Even though the different time slots of the UE are controlled with independent SS commands, the UE is not in need to execute SS commands leading to a deviation of more than [3] chip with respect to the average timing advance applied by the UE.

The synchronisation shift commands for each UL time slot (all channelisation codes on that time slot have the same SS command) will be distributed to the following rules:

1. The UL time slots the SS commands are intended for will be numbered from the first to the last UL time slot occupied by the regarded UE (starting with 0) considering all CCTrCHs allocated to that UE.
2. The commanding SS symbols on all downlink CCTrCHs allocated to one UE are numbered consecutively starting with zero according to the following rules:
  - a) The numbers of the SS commands of a regarded DL time slot are lower than those of DL time slots being transmitted after that time slot
  - b) Within a DL time slot the numbers of the SS commands of a regarded channelisation code are lower than those of channelisation codes having a bigger spreading code number

The spreading code number is defined by the following table: (see TS 25.223)

Spreading code number	SF (Q)	Walsh code number (k)
0	16	$\mathbf{c}_{Q=16}^{(k=1)}$
	...	
15	16	$\mathbf{c}_{Q=16}^{(k=16)}$
	Spreading factors 2-8 are not used in DL	
30	1	$\mathbf{c}_{Q=1}^{(k=1)}$

- c) Within a channelisation code numbers of the SS commands are lower than those of SS commands being transmitted after that time

The following equation is used to determine the UL time slot which is controlled by the regarded SS symbol:

$$UL_{pos} = (SFN' \cdot N_{SSsymbols} + SS_{pos}) \bmod (N_{ULslot}),$$

where

$UL_{pos}$  is the number of the controlled uplink time slot.

$SFN'$  is the system frame number counting the sub-frames. The system frame number of the radio frames (SFN) can be derived from  $SFN'$  by

$SFN = SFN' \text{ div } 2$ , where div is the remainder free division operation.

$N_{SSsymbols}$  is the number of SS symbols in a frame.

$SS_{pos}$  is the number of the regarded SS symbol within the sub-frame.

$N_{ULslot}$  is the number of UL slots in a frame.

The relationship between the SS Bits and the SS command for QPSK is given in table 12:

**Table 12: Coding of the SS for QPSK**

<b>SS Bits</b>	<b>SS command</b>	<b>Meaning</b>
00	'Down'	Decrease synchronisation shift by k/8 Tc
11	'Up'	Increase synchronisation shift by k/8 Tc
01	'Do nothing'	No change

The relationship between the SS Bits and the SS command for 8PSK is given in table 13:

**Table 13: Coding of the SS for 8PSK**

<b>SS Bits</b>	<b>SS command</b>	<b>Meaning</b>
000	'Down'	Decrease synchronisation shift by k/8 Tc
110	'Up'	Increase synchronisation shift by k/8 Tc
011	'Do nothing'	No change

#### 6.2.2.4 Timeslot formats

The timeslot format depends on the spreading factor, the number of the TFCI code word bits, the number of SS and TPC symbols and the applied modulation scheme (QPSK/8PSK) as depicted in the following tables.

## 6.2.2.4.1 Timeslot formats for QPSK

## 6.2.2.4.1.1 Downlink timeslot formats

**Table 14 : Time slot formats for the Downlink**

Slot Format #	Spreading Factor	Midamble length (chips)	$N_{TFCI}$ code word (bits)	$N_{SS} & N_{TPC}$ (bits)	Bits/slot	$N_{Data/Slot}$ (bits)	$N_{data/data field(1)}$ (bits)	$N_{data/data field(2)}$ (bits)
0	16	144	0	0 & 0	88	88	44	44
1	16	144	4	0 & 0	88	86	42	44
2	16	144	8	0 & 0	88	84	42	42
3	16	144	16	0 & 0	88	80	40	40
4	16	144	32	0 & 0	88	72	36	36
5	16	144	0	2 & 2	88	84	44	40
6	16	144	4	2 & 2	88	82	42	40
7	16	144	8	2 & 2	88	80	42	38
8	16	144	16	2 & 2	88	76	40	36
9	16	144	32	2 & 2	88	68	36	32
10	1	144	0	0 & 0	1408	1408	704	704
11	1	144	4	0 & 0	1408	1406	702	704
12	1	144	8	0 & 0	1408	1404	702	702
13	1	144	16	0 & 0	1408	1400	700	700
14	1	144	32	0 & 0	1408	1392	696	696
15	1	144	0	2 & 2	1408	1404	704	700
16	1	144	4	2 & 2	1408	1402	702	700
17	1	144	8	2 & 2	1408	1400	702	698
18	1	144	16	2 & 2	1408	1396	700	696
19	1	144	32	2 & 2	1408	1388	696	692
20	1	144	0	32 & 32	1408	1344	704	640
21	1	144	4	32 & 32	1408	1342	702	640
22	1	144	8	32 & 32	1408	1340	702	638
23	1	144	16	32 & 32	1408	1336	700	636
24	1	144	32	32 & 32	1408	1328	696	632

## 6.2.2.4.1.2

## Uplink timeslot formats

Table 15 : Time slot formats for the Uplink

Slot Format #	Spreading Factor	Midamble length (chips)	N <sub>TFCI</sub> code word (bits)	N <sub>s</sub> s & N <sub>TPC</sub> (bits)	Bits/slot	N <sub>Data/Slot</sub> (bits)	N <sub>Data/data field(1)</sub> (bits)	N <sub>Data/data field(2)</sub> (bits)
0	16	144	0	0 & 0	88	88	44	44
1	16	144	4	0 & 0	88	86	42	44
2	16	144	8	0 & 0	88	84	42	42
3	16	144	16	0 & 0	88	80	40	40
4	16	144	32	0 & 0	88	72	36	36
5	16	144	0	2 & 2	88	84	44	40
6	16	144	4	2 & 2	88	82	42	40
7	16	144	8	2 & 2	88	80	42	38
8	16	144	16	2 & 2	88	76	40	36
9	16	144	32	2 & 2	88	68	36	32
10	8	144	0	0 & 0	176	176	88	88
11	8	144	4	0 & 0	176	174	86	88
12	8	144	8	0 & 0	176	172	86	86
13	8	144	16	0 & 0	176	168	84	84
14	8	144	32	0 & 0	176	160	80	80
15	8	144	0	2 & 2	176	172	88	84
16	8	144	4	2 & 2	176	170	86	84
17	8	144	8	2 & 2	176	168	86	82
18	8	144	16	2 & 2	176	164	84	80
19	8	144	32	2 & 2	176	156	80	76
20	8	144	0	4 & 4	176	168	88	80
21	8	144	4	4 & 4	176	166	86	80
22	8	144	8	4 & 4	176	164	86	78
23	8	144	16	4 & 4	176	160	84	76
24	8	144	32	4 & 4	176	152	80	72
25	4	144	0	0 & 0	352	352	176	176
26	4	144	4	0 & 0	352	350	174	176
27	4	144	8	0 & 0	352	348	174	174
28	4	144	16	0 & 0	352	344	172	172
29	4	144	32	0 & 0	352	336	168	168
30	4	144	0	2 & 2	352	348	176	172
31	4	144	4	2 & 2	352	346	174	172
32	4	144	8	2 & 2	352	344	174	170
33	4	144	16	2 & 2	352	340	172	168
34	4	144	32	2 & 2	352	332	168	164
35	4	144	0	8 & 8	352	336	176	160
36	4	144	4	8 & 8	352	334	174	160
37	4	144	8	8 & 8	352	332	174	158
38	4	144	16	8 & 8	352	328	172	156
39	4	144	32	8 & 8	352	320	168	152
40	2	144	0	0 & 0	704	704	352	352
41	2	144	4	0 & 0	704	702	350	352
42	2	144	8	0 & 0	704	700	350	350
43	2	144	16	0 & 0	704	696	348	348
44	2	144	32	0 & 0	704	688	344	344
45	2	144	0	2 & 2	704	700	352	348
46	2	144	4	2 & 2	704	698	350	348

Slot Format #	Spreading Factor	Midamble length (chips)	N <sub>TFCI</sub> code word (bits)	N <sub>s</sub> & N <sub>TPC</sub> (bits)	Bits/slot	N <sub>Data/Slot</sub> (bits)	N <sub>data/data field(1)</sub> (bits)	N <sub>data/data field(2)</sub> (bits)
47	2	144	8	2 & 2	704	696	350	346
48	2	144	16	2 & 2	704	692	348	344
49	2	144	32	2 & 2	704	684	344	340
50	2	144	0	16 & 16	704	672	352	320
51	2	144	4	16 & 16	704	670	350	320
52	2	144	8	16 & 16	704	668	350	318
53	2	144	16	16 & 16	704	664	348	316
54	2	144	32	16 & 16	704	656	344	312
55	1	144	0	0 & 0	1408	1408	704	704
56	1	144	4	0 & 0	1408	1406	702	704
57	1	144	8	0 & 0	1408	1404	702	702
58	1	144	16	0 & 0	1408	1400	700	700
59	1	144	32	0 & 0	1408	1392	696	696
60	1	144	0	2 & 2	1408	1404	704	700
61	1	144	4	2 & 2	1408	1402	702	700
62	1	144	8	2 & 2	1408	1400	702	698
63	1	144	16	2 & 2	1408	1396	700	696
64	1	144	32	2 & 2	1408	1388	696	692
65	1	144	0	32 & 32	1408	1344	704	640
66	1	144	4	32 & 32	1408	1342	702	640
67	1	144	8	32 & 32	1408	1340	702	638
68	1	144	16	32 & 32	1408	1336	700	636
69	1	144	32	32 & 32	1408	1328	696	632

#### 6.2.2.4.2 Time slot formats for 8PSK

The Downlink and the Uplink timeslot formats are described together in the following table.

**Table 16: Timeslot formats for 8PSK modulation**

Slot Format #	Spreading Factor	Midamble length (chips)	N <sub>TFCI</sub> code word (bits)	N <sub>s</sub> & N <sub>TPC</sub> (bits)	Bits/slot	N <sub>Data/Slot</sub> (bits)	N <sub>data/data field(1)</sub> (bits)	N <sub>data/data field(2)</sub> (bits)
0	1	144	0	0 & 0	2112	2112	1056	1056
1	1	144	6	0 & 0	2112	2109	1053	1056
2	1	144	12	0 & 0	2112	2106	1053	1053
3	1	144	24	0 & 0	2112	2100	1050	1050
4	1	144	48	0 & 0	2112	2088	1044	1044
5	1	144	0	3 & 3	2112	2106	1056	1050
6	1	144	6	3 & 3	2112	2103	1053	1050
7	1	144	12	3 & 3	2112	2100	1053	1047
8	1	144	24	3 & 3	2112	2094	1050	1044
9	1	144	48	3 & 3	2112	2082	1044	1038
10	1	144	0	48 & 48	2112	2016	1056	960
11	1	144	6	48 & 48	2112	2013	1053	960
12	1	144	12	48 & 48	2112	2010	1053	957
13	1	144	24	48 & 48	2112	2004	1050	954
14	1	144	48	48 & 48	2112	1992	1044	948
15	16	144	0	0 & 0	132	132	66	66
16	16	144	6	0 & 0	132	129	63	66
17	16	144	12	0 & 0	132	126	63	63
18	16	144	24	0 & 0	132	120	60	60
19	16	144	48	0 & 0	132	108	54	54
20	16	144	0	3 & 3	132	126	66	60
21	16	144	6	3 & 3	132	123	63	60
22	16	144	12	3 & 3	132	120	63	57
23	16	144	24	3 & 3	132	114	60	54
24	16	144	48	3 & 3	132	102	54	48

#### 6.2.3 Training sequences for spread bursts

In this subclause, the training sequences for usage as midambles are defined. The training sequences, i.e. midambles, of different users active in the same cell and same time slot are cyclically shifted versions of one single basic midamble code. The applicable basic midamble codes are given in Annex B.1.

The basic midamble codes in Annex B.1 are listed in hexadecimal notation. The binary form of the basic midamble code shall be derived according to table 17 below.

**Table 17: Mapping of 4 binary elements  $m_i$  on a single hexadecimal digit:**

4 binary elements $m_i$	Mapped on hexadecimal digit
-1 -1 -1 -1	0
-1 -1 -1 1	1
-1 -1 1 -1	2
-1 -1 1 1	3
-1 1 -1 -1	4
-1 1 -1 1	5
-1 1 1 -1	6
-1 1 1 1	7
1 -1 -1 -1	8
1 -1 -1 1	9
1 -1 1 -1	A
1 -1 1 1	B
1 1 -1 -1	C
1 1 -1 1	D
1 1 1 -1	E
1 1 1 1	F

For each particular basic midamble code, its binary representation can be written as a vector  $\mathbf{m}_P$ :

$$\mathbf{m}_P = (m_1, m_2, \dots, m_P) \quad (1)$$

According to Annex B.1, the size of this vector  $\mathbf{m}_P$  is  $P=128$ . As QPSK modulation is used, the training sequences are transformed into a complex form, denoted as the complex vector  $\underline{\mathbf{m}}_P$ :

$$\underline{\mathbf{m}}_P = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_P) \quad (2)$$

The elements  $\underline{m}_i$  of  $\underline{\mathbf{m}}_P$  are derived from elements  $m_i$  of  $\mathbf{m}_P$  using equation (3):

$$\underline{m}_i = (j)^i \cdot m_i \text{ for all } i = 1, \dots, P \quad (3)$$

Hence, the elements  $\underline{m}_i$  of the complex basic midamble code are alternating real and imaginary.

To derive the required training sequences, this vector  $\underline{\mathbf{m}}_P$  is periodically extended to the size:

$$i_{\max} = L_m + (K-1)W \quad (4)$$

Notes on equation (4):

K and W are taken from Annex B.1

So we obtain a new vector  $\underline{\mathbf{m}}$  containing the periodic basic midamble sequence:

$$\underline{\mathbf{m}} = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_{i_{\max}}) = (\underline{m}_1, \underline{m}_2, \dots, \underline{m}_{L_m + (K-1)W}) \quad (5)$$

The first P elements of this vector  $\underline{\mathbf{m}}$  are the same ones as in vector  $\underline{\mathbf{m}}_P$ , the following elements repeat the beginning:

$$\underline{m}_i = \underline{m}_{i-P} \text{ for the subset } i = (P+1), \dots, i_{\max} \quad (6)$$

Using this periodic basic midamble sequence  $\underline{\mathbf{m}}$  for each user k a midamble  $\underline{\mathbf{m}}^{(k)}$  of length  $L_m$  is derived, which can be written as a user specific vector:

$$\underline{\mathbf{m}}^{(k)} = (\underline{m}_1^{(k)}, \underline{m}_2^{(k)}, \dots, \underline{m}_{L_m}^{(k)}) \quad (7)$$

The  $L_m$  midamble elements  $\underline{m}_i^{(k)}$  are generated for each midamble of the  $k$  users ( $k = 1, \dots, K$ ) based on:

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K-k)W} \text{ with } i = 1, \dots, L_m \text{ and } k = 1, \dots, K \quad (8)$$

The midamble sequences derived according to equations (7) to (8) have complex values and are not subject to channelisation or scrambling process, i.e. the elements  $\underline{m}_i^{(k)}$  represent complex chips for usage in the pulse shaping process at modulation.

The term 'a midamble code set' or 'a midamble code family' denotes  $K$  specific midamble codes  $\underline{m}^{(k)}$ ;  $k=1, \dots, K$ , based on a single basic midamble code  $\underline{m}_p$  according to (1).

## 6.2.4 Beamforming

Beamforming is same as that of the 3.84Mcps TDD, cf. [ 5.2.4 Beamforming ].

## 6.3 Common physical channels

### 6.3.1 Primary common control physical channel (P-CCPCH)

The BCH as described in section 4.1.2 'Common Transport Channels' is mapped onto the Primary Common Control Physical Channels (P-CCPCH1 and P-CCPCH2). The position (time slot / code) of the P-CCPCHs is fixed in the 1.28Mcps TDD. The P-CCPCHs are mapped onto the first two code channels of timeslot#0 with spreading factor of 16. The P-CCPCH is always transmitted with an antenna pattern configuration that provides whole cell coverage.

#### 6.3.1.1 P-CCPCH Spreading

The P-CCPCH uses fixed spreading with a spreading factor SF = 16. The P-CCPCH1 and P-CCPCH2 always use channelisation code  $c_{Q=16}^{(k=1)}$  and  $c_{Q=16}^{(k=2)}$  respectively.

#### 6.3.1.2 P-CCPCH Burst Format

The burst format as described in section 6.2.2 is used for the P-CCPCH. No TFCI is applied for the P-CCPCH.

#### 6.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in subclause 6.2.3 are used for the P-CCPCH. For timeslots#0 in which the P-CCPCH is transmitted, the midambles  $m^{(1)}$  and  $m^{(2)}$  are reserved for P-CCPCH in order to support Space Code Transmit Diversity (SCTD) and the beacon function, see 6.4 and 6.5. The use of midambles depends on whether SCTD is applied to the P-CCPCH:

- If no antenna diversity is applied to P-CCPCH,  $m^{(1)}$  is used and  $m^{(2)}$  is left unused.
- If SCTD antenna diversity is applied to P-CCPCH,  $m^{(1)}$  is used for the first antenna and  $m^{(2)}$  is used for the diversity antenna.

### 6.3.2 Secondary common control physical channel (S-CCPCH)

PCH and FACH as described in subclause 4.1.2 are mapped onto one or more secondary common control physical channels (S-CCPCH). In this way the capacity of PCH and FACH can be adapted to the different requirements. The time slot and codes used for the S-CCPCH are broadcast on the BCH.

### 6.3.2.1 S-CCPCH Spreading

The S-CCPCH uses fixed spreading with a spreading factor SF = 16. The S-CCPCHs ( S-CCPCH 1 and S-CCPCH 2 ) are always used in pairs, mapped onto two code channels with spreading factor 16. There can be more than one pair of S-CCPCHs in use in one cell.

### 6.3.2.2 S-CCPCH Burst Format

The burst format as described in section 6.2.2 is used for the S-CCPCH. TFCI may be applied for S-CCPCHs.

### 6.3.2.3 S-CCPCH Training sequences

The training sequences, i.e. midambles, as described in the subclause 6.2.3 are also used for the S-CCPCH.

## 6.3.3 Fast Physical Access CHannel (FPACH)

The Fast Physical Access CHannel (FPACH) is used by the Node B to carry, in a single burst, the acknowledgement of a detected signature with timing and power level adjustment indication to a user equipment. FPACH makes use of one code with spreading factor 16, so that its burst is composed by 44 symbols. The spreading code, training sequence and time slot position are configured by the network and signalled on the BCH.

### 6.3.3.1 FPACH burst

The FPACH burst contains 32 information bits. Table 18 reports the content description of the FPACH information bits and their priority order:

**Table 18: FPACH information bits description**

Information field	Length (in bits)
Signature Reference Number	3 (MSB)
Relative Sub-Frame Number	2
Received starting position of the UpPCH (UpPCH <sub>POS</sub> )	11
Transmit Power Level Command for RACH message	7
Reserved bits (default value: 0)	9 (LSB)

In the use and generation of the information fields is explained in [9].

#### 6.3.3.1.1 Signature Reference Number

The reported number corresponds to the numbering principle for the cell signatures as described in [8].

The Signature Reference Number value range is 0 – 7 coded in 3 bits such that:

bit sequence(0 0 0) corresponds to the first signature of the cell; ...; bit sequence (1 1 1) corresponds to the 8<sup>th</sup> signature of the cell.

#### 6.3.3.1.2 Relative Sub-Frame Number

The Relative Sub-Frame Number value range is 0 – 3 coded such that:

bit sequence (0 0) indicates one sub-frame difference; ...; bit sequence (1 1) indicates 4 sub-frame difference.

#### 6.3.3.1.3 Received starting position of the UpPCH (UpPCH<sub>POS</sub>)

The received starting position of the UpPCH value range is 0 – 2047 coded such that:

bit sequence (0 0 ... 0 0 0) indicates the received starting position zero chip; ...; bit sequence (1 1 ... 1 1 1) indicates the received starting position 2047\*1/8 chip.

### 6.3.3.1.4 Transmit Power Level Command for the RACH message

The transmit power level command is transmitted in 7 bits.

### 6.3.3.2 FPACH Spreading

The FPACH uses only spreading factor SF=16 as described in subclause 6.3.3. The set of admissible spreading codes for use on the FPACH is broadcast on the BCH.

### 6.3.3.2 FPACH Burst Format

The burst format as described in section 6.2.2 is used for the FPACH.

### 6.3.3.3 FPACH Training sequences

The training sequences, i.e. midambles, as described in subclause 6.2.3 are used for FPACH.

### 6.3.3.4 FPACH timeslot formats

The FPACH uses slot format #0 of the DL time slot formats given in subclause 6.2.2.4.1.1.

## 6.3.4 The physical random access channel (PRACH)

The RACH as described in subclause 4.1.2 is mapped onto one or more uplink physical random access channels (PRACH). In such a way the capacity of RACH can be flexibly scaled depending on the operators need.

### 6.3.4.1 PRACH Spreading

The uplink PRACH uses either spreading factor SF=16, SF=8 or SF=4 as described in subclause 6.2.1. The set of admissible spreading codes for use on the PRACH and the associated spreading factors are broadcast on the BCH (within the RACH configuration parameters on the BCH).

### 6.3.4.2 PRACH Burst Format

The burst format as described in section 6.2.2 is used for the PRACH.

### 6.3.4.3 PRACH Training sequences

The training sequences, i.e. midambles, of different users active in the same time slot are time shifted versions of a single periodic basic code. The basic midamble codes as described in subclause 6.2.3 are used for PRACH.

### 6.3.4.4 PRACH timeslot formats

The PRACH uses the following time slot formats taken from the uplink timeslot formats described in sub-clause 6.2.2.4.1.2:

Spreading Factor	Slot Format #
16	0
8	10
4	25

### 6.3.4.5 Association between Training Sequences and Channelisation Codes

The association between training sequences and channelisation codes of PRACH in the 1.28McpsTDD is same as that of the DPCH.

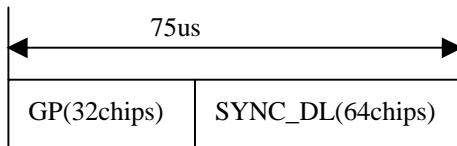
### 6.3.5 The synchronisation channels (DwPCH, UpPCH)

There are two dedicated physical synchronisation channels —DwPCH and UpPCH in each 5ms sub-frame of the 1.28Mcps TDD. The DwPCH is used for the down link synchronisation and the UpPCH is used for the uplink synchronisation.

The position and the contents of the DwPCH are equal to the DwPTS as described in the subclause 6.1., while the position and the contents of the UpPCH are equal to the UpPTS.

The DwPCH is transmitted at each sub-frame with an antenna pattern configuration which provides whole cell coverage. Furthermore it is transmitted with a constant power level which is signalled by higher layers.

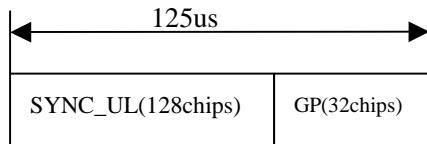
The burst structure of the DwPCH ( DwPTS) is described in the figure 27.



**Figure 27: burst structure of the DwPCH ( DwPTS)**

Note: 'GP' for 'Guard Period'

The burst structure of the UpPCH ( UpPTS) is described in the figure 28.



**Figure 28: burst structure of the UpPCH ( UpPTS)**

The SYNC-DL code in DwPCH and the SYNC-UL code in UpPCH are not spreaded. The details about the SYNC-DL and SYNC-UL code are described in the corresponding subclause and annex in [8].

### 6.3.6 Physical Uplink Shared Channel (PUSCH)

For Physical Uplink Shared Channel (PUSCH) the burst structure of DPCH as described in subclause 6.2 shall be used. PUSCH provides the possibility for transmission of TFCI in uplink.

### 6.3.7 Physical Downlink Shared Channel (PDSCH)

For Physical Downlink Shared Channel (PDSCH) the burst structure of DPCH as described in subclause 6.2 shall be used. PDSCH provides the possibility for transmission of TFCI in downlink.

To indicate to the UE that there is data to decode on the DSCH, three signalling methods are available:

- 1) using the TFCI field of the associated channel or PDSCH;
- 2) using on the DSCH user specific midamble derived from the set of midambles used for that cell;
- 3) using higher layer signalling.

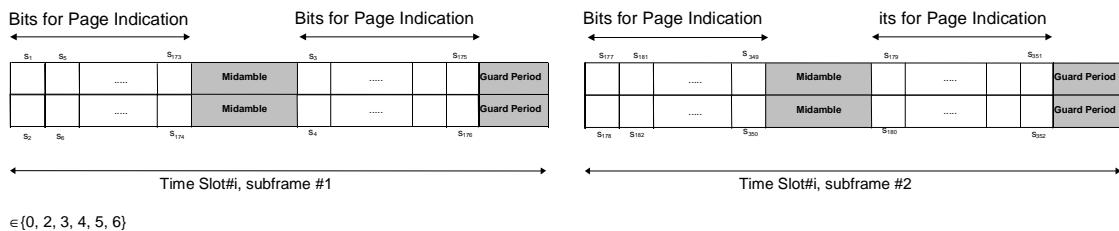
When the midamble based method is used, the UE shall decode the PDSCH if the PDSCH was transmitted with the midamble assigned to the UE by UTRAN, see 6.6.1.1.2 . For this method no other physical channels may use the same time slot as the PDSCH and only one UE may share the PDSCH time slot at the same time.

### 6.3.8 The Page Indicator Channel (PICH)

The Paging Indicator Channel (PICH) is a physical channel used to carry the paging indicators.

#### 6.3.8.1 Mapping of Paging Indicators to the PICH bits

Figure 29 depicts the structure of a PICH transmission and the numbering of the bits within the bursts. The burst type as described in [6.2.2 ‘Burst Format’] is used for the PICH.  $N_{PIB}$  bits are used to carry the paging indicators, where  $N_{PIB}=352$ .



**Figure 29: Transmission and numbering of paging indicator carrying bits in the PICH bursts**

Each paging indicator  $P_q$  (where  $P_q, q = 0, \dots, N_{PI}-1, P_q \in \{0, 1\}$ ) in one radio frame is mapped to the bits  $\{S_{2L_{PI}^*q+1}, \dots, S_{2L_{PI}^*(q+1)}\}$  in subframe #1 or subframe #2.

The setting of the paging indicators and the corresponding PICH bits is described in [7].

In each radio frame,  $N_{PI}$  paging indicators are transmitted, using  $L_{PI}=2$ ,  $L_{PI}=4$  or  $L_{PI}=8$  symbols. The number of paging indicators  $N_{PI}$  per radio frame is given by the paging indicator length, which is signalled by higher layers. In table 19 this number is shown for the different possibilities of paging indicator lengths.

**Table 19: Number  $N_{PI}$  of paging indicators per radio frame for different paging indicator lengths  $L_{PI}$**

	$L_{PI}=2$	$L_{PI}=4$	$L_{PI}=8$
$N_{PI}$ per radio frame	88	44	22

#### 6.3.8.2 Structure of the PICH over multiple radio frames

The structure of the PICH over multiple radio frames is common with 3.84 Mcps TDD, cf. [5.3.7.2 Structure of the PICH over multiple radio frames]

## 6.4 Transmit Diversity for DL Physical Channels

Table 20 summarizes the different transmit diversity schemes for different downlink physical channel types in 1.28Mcps TDD that are described in [9].

**Table 20: Application of Tx diversity schemes on downlink physical channel types in 1.28Mcps TDD**  
"X" – can be applied, "–" – must not be applied

Physical channel type	Open loop TxDiversity		Closed loop TxDiversity
	TSTD	SCTD	
P-CCPCH	X	X	–
DwPCH	X	–	–
DPCH	X	–	X
PDSCH	X	–	X

## 6.5 Beacon characteristics of physical channels

For the purpose of measurements, physical channels at particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The location of the beacon channels is called beacon location. The beacon channels shall provide the beacon function, i.e. a reference power level at the beacon location, regularly existing in each subframe. Thus, beacon channels must be present in each subframe.

### 6.5.1 Location of beacon channels

The beacon location is described as follows :

The beacon function shall be provided by the physical channels that are allocated to channelisation code  $c_{Q=16}^{(k=1)}$  and  $c_{Q=16}^{(k=2)}$  in Timeslot#0.

Note that by this definition the P-CCPCH always has beacon characteristics.

### 6.5.2 Physical characteristics of the beacon function

The beacon channels shall have the following physical characteristics.

They:

- are transmitted with reference power;
- are transmitted without beamforming;
- use midamble  $m^{(1)}$  and  $m^{(2)}$  exclusively in this time slot

The reference power corresponds to the sum of the power allocated to both midambles  $m^{(1)}$  and  $m^{(2)}$ . Two possibilities exist:

- If no antenna diversity is applied to the P-CCPCH, all the reference power of any beacon channel is allocated to  $m^{(1)}$ .
- If SCTD antenna diversity is applied to the P-CCPCH, for any beacon channel midambles  $m^{(1)}$  and  $m^{(2)}$  are each allocated half of the reference power. Midamble  $m^{(1)}$  is used for the first antenna and  $m^{(2)}$  is used for the diversity antenna. SCTD is applied to the P-CCPCH, see [9]; for all other beacon channels identical spread data sequences are transmitted on both antennas.

## 6.6 Midamble Allocation for Physical Channels

The midamble allocation schemes for physical channels are the same as in the 3.84Mcps TDD option. The associations between channelisation codes and midambles for the default and common midamble allocation differ from the 3.84 Mcps TDD option. The associations are given in Annex B.2 [Association between Midambles and channelisation Codes] and D [Signalling of the number of channelisation codes for the DL common midamble case for 1.28Mcps TDD] respectively

### 6.6.1 Midamble Allocation for DL Physical Channels

Beacon channels shall always use the reserved midambles  $m^{(1)}$  and  $m^{(2)}$ , see 6.5. For the other DL physical channels that are located in timeslot #0, midambles shall be allocated based on the default midamble allocation scheme, using the association for K=8 midambles. For all other DL physical channels, the midamble is explicitly assigned by higher layers or allocated by layer 1.

#### 6.6.1.1 Midamble Allocation by signalling from higher layers

The midamble allocation by signalling is the same like in the 3.84 Mcps TDD cf. [5.6.1.1 Midamble allocation by signalling from higher layers]

### 6.6.1.2 Midamble Allocation by layer 1

#### 6.6.1.2.1 Default midamble

The default midamble allocation by layer 1 is the same like in the 3.84 Mcps TDD cf. [5.6.1.2.1 Default midamble]. The associations between midambles and channelisation codes are given in Annex B.2 [Association between Midambles and channelisation Codes].

#### 6.6.1.2.2 Common Midamble

The common midamble allocation by layer 1 is the same like in the 3.84 Mcps TDD cf. [5.6.1.2.2 Common midamble]. The respective associations are given in Annex D [Signalling of the number of channelisation codes for the DL common midamble case for 1.28 Mcps TDD].

## 6.6.2 Midamble Allocation for UL Physical Channels

The midamble allocation for UL Physical Channels is the same as in the 3.84 Mcps TDD cf. [5.6.2 Midamble allocation for UL Physical Channels]

## 6.7 Midamble Transmit Power

The setting of the midamble transmit power is done as in the 3.84 Mcps TDD option cf. 5.7 ‘Midamble Transmit Power’.

## 7 Mapping of transport channels to physical channels for the 3.84 Mcps option

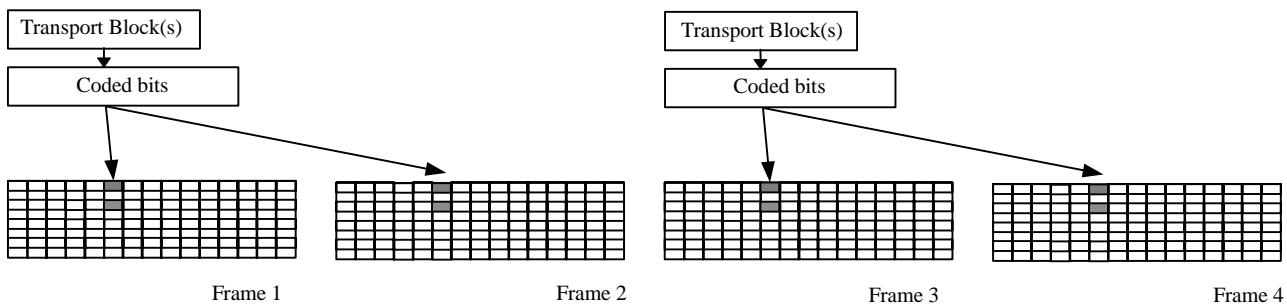
This clause describes the way in which transport channels are mapped onto physical resources, see figure 30.

Transport Channels	Physical Channels
DCH	Dedicated Physical Channel (DPCH)
BCH	Primary Common Control Physical Channel (P-CCPCH)
FACH	Secondary Common Control Physical Channel (S-CCPCH)
PCH	
RACH	Physical Random Access Channel (PRACH)
USCH	Physical Uplink Shared Channel (PUSCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
	Paging Indicator Channel (PICH)
	Synchronisation Channel (SCH)
	Physical Node B Synchronisation Channel (PNBSCH)

Figure 30: Transport channel to physical channel mapping

## 7.1 Dedicated Transport Channels

A dedicated transport channel is mapped onto one or more physical channels. An interleaving period is associated with each allocation. The frame is subdivided into slots that are available for uplink and downlink information transfer. The mapping of transport blocks on physical channels is described in TS 25.222 ("multiplexing and channel coding").



**Figure 31: Mapping of Transport Blocks onto the physical bearer**

For NRT packet data services, shared channels (USCH and DSCH) can be used to allow efficient allocations for a short period of time.

## 7.2 Common Transport Channels

### 7.2.1 The Broadcast Channel (BCH)

The BCH is mapped onto the P-CCPCH. The secondary SCH codes indicate in which timeslot a mobile can find the P-CCPCH containing BCH.

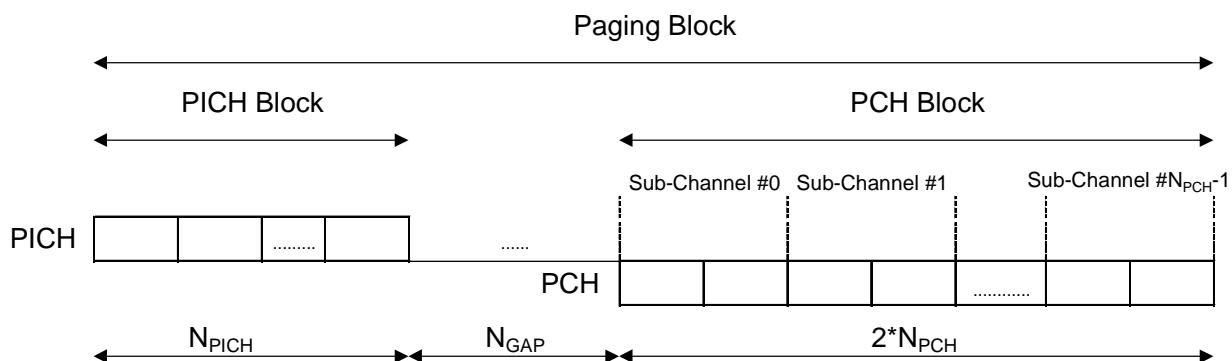
### 7.2.2 The Paging Channel (PCH)

The PCH is mapped onto one or several S-CCPCHs so that capacity can be matched to requirements. The location of the PCH is indicated on the BCH. It is always transmitted at a reference power level.

To allow an efficient DRX, the PCH is divided into PCH blocks, each of which comprising  $N_{PCH}$  paging sub-channels.  $N_{PCH}$  is configured by higher layers. Each paging sub-channel is mapped onto 2 consecutive PCH frames within one PCH block. Layer 3 information to a particular UE is transmitted only in the paging sub-channel, that is assigned to the UE by higher layers, see [15]. The assignment of UEs to paging sub-channels is independent of the assignment of UEs to page indicators.

#### 7.2.2.1 PCH/PICH Association

As depicted in figure 32, a paging block consists of one PICH block and one PCH block. If a paging indicator in a certain PICH block is set to '1' it is an indication that UEs associated with this paging indicator shall read their corresponding paging sub-channel within the same paging block. The value  $N_{GAP}>0$  of frames between the end of the PICH block and the beginning of the PCH block is configured by higher layers.



**Figure 32: Paging Sub-Channels and Association of PICH and PCH blocks**

### 7.2.3 The Forward Channel (FACH)

The FACH is mapped onto one or several S-CCPCHs. The location of the FACH is indicated on the BCH and both, capacity and location can be changed, if required. FACH may or may not be power controlled.

### 7.2.4 The Random Access Channel (RACH)

The RACH has intraslot interleaving only and is mapped onto PRACH. The same slot may be used for PRACH by more than one cell. Multiple transmissions using different spreading codes may be received in parallel. More than one slot per frame may be administered for the PRACH. The location of slots allocated to PRACH is broadcast on the BCH. The PRACH uses open loop power control. The details of the employed open loop power control algorithm may be different from the corresponding algorithm on other channels.

### 7.2.5 The Uplink Shared Channel (USCH)

The uplink shared channel is mapped on one or several PUSCH, see subclause 5.5.

### 7.2.6 The Downlink Shared Channel (DSCH)

The downlink shared channel is mapped on one or several PDSCH, see subclause 5.6.

## 8 Mapping of transport channels to physical channels for the 1.28 Mcps option

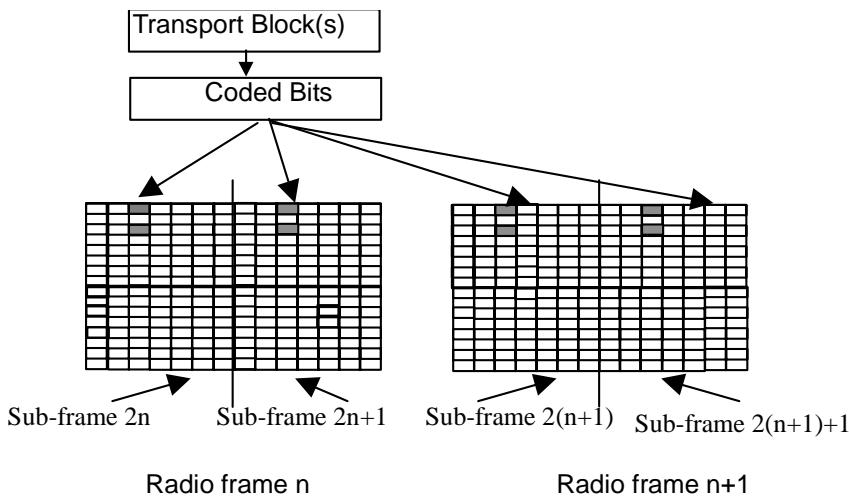
This clause describes the way in which the transport channels are mapped onto physical resources, see figure 33.

Transport channels	Physical channels
DCH	Dedicated Physical Channel (DPCH)
BCH	Primary Common Control Physical Channels (P-CCPCH)
PCH	Secondary Common Control Physical Channels(S-CCPCH)
FACH	Secondary Common Control Physical Channels(S-CCPCH)
	PICH
RACH	Physical Random Access Channel (PRACH)
USCH	Physical Uplink Shared Channel (PUSCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
	Down link Pilot Channel (DwPCH)
	Up link Pilot Channel (UpPCH)
	FPACH

Figure 33: Transport channel to physical channel mapping for 1.28Mcps TDD

### 8.1 Dedicated Transport Channels

The mapping of transport blocks to physical bearers is in principle the same as in 3.84 Mcps TDD but due to the subframe structure the coded bits are mapped onto each of the subframes within the given TTI.



**Figure 34 : Mapping of Transport Blocks onto the physical bearer ( TTI= 20ms )**

## 8.2 Common Transport Channels

### 8.2.1 The Broadcast Channel (BCH)

There are two P-CCPCHs, P-CCPCH 1 and P-CCPCH 2 which are mapped onto timeslot#0 using the channelisation codes  $c_{Q=16}^{(k=1)}$  and  $c_{Q=16}^{(k=2)}$  with spreading factor 16. The BCH is mapped onto the P-CCPCH1+P-CCPCH2.

The position of the P-CCPCHs is indicated by the relative phases of the bursts in the DwPTS with respect to the P-CCPCHs midamble sequences, see [8]. One special combination of the phase differences of the burst in the DwPTS with respect to the P-CCPCH midamble indicates the position of the P-CCPCH in the multi-frame and the start position of the interleaving period.

### 8.2.2 The Paging Channel (PCH)

The mapping of Paging Channels onto S-CCPCHs and the association between PCHs and Paging Indicator Channels is the same as in the 3.84 Mcps TDD option, cf. 7.2.2 'The paging Channel' and 7.2.2.1 'PCH/PICH Association' respectively.

### 8.2.3 The Forward Channel (FACH)

The FACH is mapped onto one or several S-CCPCHs. The location of the FACH is indicated on the BCH and both, capacity and location can be changed, if required. FACH may or may not be power controlled.

### 8.2.4 The Random Access Channel (RACH)

The RACH is mapped onto PRACH. More than one slot per frame may be administered for the PRACH. The location of slots allocated to PRACH is broadcast on the BCH. The uplink sync codes (SYNC-UL sequences) used by the UEs for UL synchronisation have a well known association with the P-RACHs, as broadcast on the BCH. On the PRACH, both power control and uplink synchronisation control are used.

### 8.2.5 The Uplink Shared Channel (USCH)

The uplink shared channel is mapped onto one or several PUSCH, see subclause 6.3.6 'Physical Uplink Shared Channel (PUSCH)'

## 8.2.6 The Downlink Shared Channel (DSCH)

The downlink shared channel is mapped onto one or several PDSCH, see subclause 6.3.7 ‘Physical Downlink Shared Channel (PDSCH)’

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## Annex A (normative): Basic Midamble Codes for the 3.84 Mcps option

### A.1 Basic Midamble Codes for Burst Type 1 and 3

In the case of burst type 1 or 3 (see subclause 5.2.2) the midamble has a length of  $Lm=512$ , which is corresponding to:  
 $K'=8$ ;  $W=57$ ;  $P=456$ .

Depending on the possible delay spread cells are configured to use  $K_{Cell}$  midambles which are generated from the Basic Midamble Codes (see table A-1)

- for all  $k=1,2,\dots,K$ ;  $K=2K'$  or
- for  $k=1,2,\dots,K'$ , only, or
- for odd  $k=1,3,5,\dots,\leq K'$ , only.

Depending on the cell size midambles for PRACH are generated from the Basic Midamble Codes (see table A-1)

- for  $k=1,2,\dots,K'$  or
- for odd  $k=1,3,5,\dots,\leq K'$ , only.

The cell configuration is broadcast on BCH.

The mapping of these Basic Midamble Codes to Cell Parameters is shown in TS 25.223.

**Table A-1: Basic Midamble Codes  $m_p$  according to equation (5) from subclause 5.2.3 for case of burst type 1 and 3**

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
$m_{PL0}$	8DF65B01E4650910A4BF89992E48F43860B07FE55FA0028E454EDCD1F0A09A6F029668F55427 253FB8A71E5EF2EF360E539C489584413C6DC4
$m_{PL1}$	4C63F9BC3FD7B655D5401653BE75E1018DC26D271AADA1CF13FD348386759506270F2F953E9 3A44468E0A76605EA8526225903B1201077602
$m_{PL2}$	8522611FFCAEB55A5F07D966036C852E7B15B893B3ABA9672C327380283D168564B8E1200F0E 2205AF1BB23A58679899785CFA2A6C131CFDC4
$m_{PL3}$	F58107E6B777C221999BDE9340E192DC6C31AB8AE85E70AA9BBEB39727435412A5A27C0EF7 3AB453ED0D28E5B032B94306EC1304736C91E922
$m_{PL4}$	89670985013DFD2223164B68A63BD58C7867E97316742D3ABD6CBDA4FC4E08C0B0CBE44451 575C72F887507956BD1F27C466681800B4B016EE
$m_{PL5}$	FCDEF63500D6745CDB962594AF171740241E982E9210FC238C4DD85541F08C1A010F7B3161A 7F4DF19BAD916FD308AB1CED2A32538C184E92C
$m_{PL6}$	DB04CE77A5BA7C0E09B6D3551072B11A7A43B6A355C1D6FDCF725D587874999895748DD098 32ABC35CEC3008338249612E6FE5005E13B03103
$m_{PL7}$	D2F61A622D0BA9E448CD29587D398EF8CDC3B6582B6CDD50E9E20BF5FE2B3258041E14D608 21DC6725132C22D787CD5D497780D4241E3B420D
$m_{PL8}$	7318524E62D806FA149ECC5435058A2B74111524B84727FE9A7923B4A1F0D8FCD89208F34BE E5CADEB90130F9954BB30605A98C11045FF173D
$m_{PL9}$	8E832B4FA1A11E0BF318E84F54725C8052E0D099EF0AF54BC342BEE44976C9F38DE701623C7 BF6474DF90D2E2222A4915C8080E7CD3EC84DAC
$m_{PL10}$	CFA5BAC90780876C417933C43103B55699A8AD51164E590AF9DA6AF0C18804E1F74862F00CE 7ECC899C85B6ABB0CAD5E50836AD7A39878FE2F
$m_{PL11}$	AD539094A19858A75458F1B98E286A4F7DC3A117083D04724CBE83F34102817C5531329CDB43 7FFF712241B644BDF0C1FEC8598A63C2F21BD7
$m_{PL12}$	BEB8483139529BDE23E42DA6AB8170DD0BFBB30CE28A4502FAF3C8EDA219B9A6D5B849D9C 9E4451F74E2408EA046061201E0C1D69CF48F3A94
$m_{PL13}$	C482462CA7846266060D21688BA00B72E1EC84A3D5B7194C8DA39E21A3CE12BF512C8AAB6A 7079F73C0D3E4F40AC555A4BCC453F1DFE3F6C82

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
m <sub>PL</sub> 14	9663373935FD5C213AC58C0670206683D579D2526C05B0A81030DDF61A221D8A68EAD8D6F7AA0D662C07C6DCD0115A54D39F03F7122B0675AC
m <sub>PL</sub> 15	387397AE5CD3F2B3912C26B8F87CE82CEFEC55507DB08FB0C4CF2FD6858896201ACA7264281D0298440DD3481E5E9DDB24C16F30EB7A22948A
m <sub>PL</sub> 16	AFC9266843C892571B6230D808788C63B9065EA3BDFF687B92B8734A8D7099559FEA22C9416576D0C087EB4503E87E356471B330182A24A3E6
m <sub>PL</sub> 17	6E6C550A4CB74010F6C3E0328651DF421C456D9A5E8AE9D3946C10189D72B579184552EE3E799970969C870FE8A37B6C4BA890992103486DC0
m <sub>PL</sub> 18	D803CA71B6F99CFB3105D40F4695D61EB0B62E803F79302EE3D2A6BF12EA70D304B181E8B38B3B74F5022B67EB8109808C62532688C563D4BE
m <sub>PL</sub> 19	E599ED48D01772055DBE9D343A4EA5EABE643DA38F06904FC7523B08C4101F021B199AF759A00D9AC298881D79413A77470992A75C771492D0
m <sub>PL</sub> 20	9F30AC4162CE5D185953705F3D45F026F38E9B5721AEFE07370214D526A2C4B344B508B57BFB2492320C05903C79CBEE08C6E7F218B57E14D6
m <sub>PL</sub> 21	B5971060DA84685B4D042ED0189FAF13C961B2EF61CC164E363B22AAB14AC8AF607906C1C6E04F2054C687AA6741A9E70639857DA02B6FFFFA
m <sub>PL</sub> 22	97135FC2226C4B4A5CBA5FCA3732763B87455F73A1148006F3DF214BD4C936D061E04045160E2CE33B9CD09D08FDE2A37F4E998322B4401D27
m <sub>PL</sub> 23	4D256D57C861B9791151A78D5299C56D116B6178B2A2D04BB95FB76540AF28341DC6EC4E7ED3BF9E508478D9C8F44914805DA82429E1CF320E
m <sub>PL</sub> 24	858EF5C84CE32D18D9ABA110EEA7474CF0CD70254D2928C3F4DFF6BB3A518587CADA19029078AC90A8336C8178203BE3289E601F07D089CB64
m <sub>PL</sub> 25	920A8796A511650AEF32F93DD3C39C624E07AE03CE8C96139973F54DCB9803C5164ADB502D4FF561564D607037FCDF172921F1982B102C3312C
m <sub>PL</sub> 26	485C5DAE76B360A9C56E20B8422EA3E6ACF07CB093B5587CB0E6A5498A4714081EA98DBCDB0482B26E0D097C03444473D233BEF3C8E440DEBF
m <sub>PL</sub> 27	565A9D54EA789892B024F97E728E8EE112411942C48BD0C5BC8AA457D8DC9941F0F7424B38643FFE6521CD306FBC56FE10F1428D4C245B5606
m <sub>PL</sub> 28	5AEF2C0C2C378179A1AC36242E6B3EDB72C42D3624437674F8D51260C0898C201837CBA14E9E23D1EF6451C4ACF27AB031F457A8A1BFD148AE
m <sub>PL</sub> 29	87D8FE685417822A23D925307E6C11081ADAC4702BCCD9BE448E78984D109B50DEF5B7C58BC71EA1F0A6826BA8AD1978843E7697F3E416AADA

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
m <sub>PL</sub> 30	84802B72AF27B5BE724D1FB629E0E627BDB0D9061292562F98350C1D0C9D4B9D8E2BF71123C 82EBB161003AE9829E07244D78F19926F8847A2
m <sub>PL</sub> 31	8CCB5128238BCB088E30972D62792AEF02B9BBDDCAD68C9916C00BF91CBE788B0F03851FA AF88605534FD73436C259D270B1013CB14226F658
m <sub>PL</sub> 32	62F4E6FAC2BF1979CE6854AA2D33534BFB2F946519101A6589131C3640707D40E67ED804AF8 736AD213CAF593574190061967E8285C27E34C
m <sub>PL</sub> 33	4095E5B4EEAFCDF68A34B267EEA28D8444FA533900F41499E260D2E65C256A52E1DD5861F52 27C98E00687D107233F51A1167BCF72FB184654
m <sub>PL</sub> 34	5630E9A79FCAD303404D9E5A802299162657AAC734761C6E90DA8BCE4F61A763E0BB48D3FE B3F78468C828ABA4828DAD06E0F904CFD40421DC
m <sub>PL</sub> 35	CD12B24C0BCA8AAC1FCBF0500A3BC684A180E863D888F2506B48C68ECF17F76CB285991FB A18EB6397211FAD002F482D57A258CD45DE3FF1A6
m <sub>PL</sub> 36	AFCF2A50877286CD3405442730C45514F082D9EC296B367C0F64F04C4E0007DCA9E50BEED5 C102126E319ACBC64F1729272F2F72C9397029FE
m <sub>PL</sub> 37	18F89EE8589D20882A72A44DCCDF0050F0A3D88DBA6531614973D26905FDF41E3F779FF0648 E8AF1540928511BCF4C25D9C64F34AC31B8965
m <sub>PL</sub> 38	F890D550F33F032ECD A3A51FED427D634F64EB29AF1332A23CD961258E4BAED040E7B33691 8E250EC272A12816B9EBFFA1E0AE401185F08C10
m <sub>PL</sub> 39	ACE5DD61506047E80FB7D41BD3992DF4D7F18EB46CC145C0E9105428C2F8F299141F5D6669 1904A7DC2513A3B83994ACB1292246B32818FE9D
m <sub>PL</sub> 40	150680FF900C9B46E1E24D54BE2238CB950A934E5CCDE9BC3939EB51CB0AE202B7D339EEC 2018B33A0AB9B63DA5D512D64FB58C0E51A1C82C2
m <sub>PL</sub> 41	51A579EED2663A002D32D10A0753173612F4D5BA167D1807C61F25C4D42C063682E8E9DD019 F79D446A046EB3F75E50FEB228DC52F08E694B6
m <sub>PL</sub> 42	CDC644FE4C0C6897604F9D14D714123BF16FFF0E49F35F674908CA60653702FE27BCCA2A470 98453AF8661055C8C549EB6A951A8396AD4B94D
m <sub>PL</sub> 43	750A10366C595373C5001CA3E4239764B1409D602CF6052B39BC6A3255A15FE06C782C4C5F8 47026A7E79838A2933A61C77BB6CBF5915B2DA5
m <sub>PL</sub> 44	B7490686D78E409082C4C48FE18D4C35429C20AADF96076B92FC4E85490664753DB0891A0B2 7FD849BB7FCA99E3B38F22F8C662852C0D35AA6
m <sub>PL</sub> 45	D86E1B575B47D23DA811806A54C231281F03317830E7BD305D3CAA7D6382A5233104CFD54D2 2DF9F34535E5B390D9040CF1375FEA44CEC29E2
m <sub>PL</sub> 46	828655960C026EC67B683480992AC2ED2C43ABC606F5220C2945F373470BE7ED5BCCF7C1AA 0986BBCCC84F11F658AA568FAA0A60C5F0B5BFA
m <sub>PL</sub> 47	D76230E02C8533653AAB99B288AA2ADE25A1C1BF28516C04239240EAF1EFC0B98974B51F886 861D8A1E9F5D62CFFEC309F071A9716B325101B
m <sub>PL</sub> 48	EA207662865B8A07D69648964DED818EE474A90B94473408871880E63EF0596B9FCFEC3C06B 86EA6AD2B06C91672EFB33C70241A5450B59B8A
m <sub>PL</sub> 49	9CB5459549909835FAB22F0D99298C120ACF479F814CCE749079D40688F28101037762F125C7 76DA9C5FA1FCE076E452F8185354FDCDE94E2
m <sub>PL</sub> 50	227506304AEC1D6F93569B51FDC3405A0F38194F65BE17163A3CB9827A35AECEA757D020FE2 49377ECD561428A38FEED004EC859C272563185
m <sub>PL</sub> 51	96B9AEC9938910F0E533422A3977519B05CD4AD3909BC15A7502D48D49C124FA192A8E57027 CFEB11DF542010603CE5C9FDF8E626D4FBF8CF4
m <sub>PL</sub> 52	A6AAD06E095A9BE0BD9F8A2ED40C3CBD BAE91C700CBB778C8696CC06F3A675C16BDB2918 E5F2111005A8727206DC6A9684E05655185C398EEB
m <sub>PL</sub> 53	CD168D384A78DA172991AD333EE2A9880905AFE59E2A2A4AC4414C40F82874F98A3CBE7B44 F4C7F4710B35FD88AFC0399FAEB070EB9CA4D30A
m <sub>PL</sub> 54	22016CA87AD1549174A8699DD65599697871091457E83E0912E7E77A06531C209394D283D18A 38662B73681DD9C5BF330FED978BDA7D487CA8
m <sub>PL</sub> 55	B9401B0843AA6F7827A13BD66C922287E8886C31EB5B90B82B472CCD6DA3D8D4FBF78B8F84 96DFA8252B06429D5DD17142F1C908ACCD70EA0C
m <sub>PL</sub> 56	E42B9EFDC5D09AC27B3C7DA28D02493A70521223B9D7A76A9D13E9C171017964D16A70C08E AD02C3DC948889C23E365AFCF01BF20B89B0BF5C
m <sub>PL</sub> 57	9DA0180168DB915E9F3597B59312198E1B5CC00D743C2ECB0DBAADA3E35A2465ED1EAA9D7 4734D49A313CE4DFF020D0760E3153DC485603943
m <sub>PL</sub> 58	B6C966619ECB98191D719C187C07BD503425650CAA3A2D1F2DF5212B1441D7A0C1D36A4C9C 2550240AD17CA43BB3943DFFFBF1E283D81299CC
m <sub>PL</sub> 59	DB0E8C41F08A03D477C1AA548799274C4BF3EB68F2636166FDC8D4B1E7132539930297E228B A232BB5C279FA5ECA3AC10E24361AF050A453B8
m <sub>PL</sub> 60	89BCE2DE2974EEBA833CF32F224C85A2891484478527DB48FA6ECEA84C5E288CC3914CB54A DA0476278750187F68FBEA41017E1E58DF1A5A3D
m <sub>PL</sub> 61	70A457D1314A278625443EEB52520815EC92CEF17417B97440DCB531BC1CE83212F63270418 D0FBDE71F6DB9E0EA88772E1E4535B6633E4425

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
mPL62	C388460AD54B36C4452CF0433BD347100ACCC24C79C535AD3E1F23FE0425E93A044C553BFA 116E09AA4BB32F13CFA76FBA1BC17520F45EFD44
mPL63	0BAFCADCDF9AA2846681782CD3B90CA036A863C78EE1507620BC394D0C6804B4C97A15BC9 C0D7B79E6892EA1BFF1A0DD9573A9213AB140D0D2
mPL64	833B0226789A62882FCD27A30885E67872B1A1C2FA484AD498011599DD57E8E2A07A560B4716 7AA5F60EF47177DBB1632D5387A2896348640B
mPL65	8F52820323ABA5E6C6B465821B621600B980E59F53A599DA5646BA103214336836CF17E3386C E4FB2BC5F25CCB30CF7F500546828EC8786B8E
mPL66	E2E9A29C3C8207B9A4508FD2F667A159F068EEE8D00686F46EA904C3692C1D79DFF1B32E510 3720D47B4B58AC35384A26087027E141B3126A8
mPL67	70E7C39FD2D3AE1DCE341699A544D801A8688A6EE47C5CB3630022147DDC06241FC5337A34 8A462B2472DEC5E104DD520ADA5114DB065D4B0D
mPL68	9E3483CAB164BD053C4971D4D87494CC689033D589EF80E5453376E4A8DCC02183B98C36B0 FF7DDC0AD07FCE8B4D5164371BD03A2110AD1247
mPL69	04DA1C649B0608938DAADD3FE920A4F681690C54505429DBDCDCF10067AB5714BCDDFE1F2 8692710F794765781C1D233344E119BEE8A8416DC
mPL70	7A18D6D30BDF44410714C3DCA27D8F9EA8A542D87122205640B98313C91AD9A0B993A5A7BC 3E035F93B88BBE6D4204BC82A9FA8D4C1A7618CF
mPL71	EB9525E10265A48733C8E0E77E459310112A71DCA680F68AC044B64BC0A31D02EEA0F7ACAA AB7F1E574E94FEA2D1301CB14B03263DA8122B76
mPL72	E706C6ED2D6F89153835079BE0C6D45310845EF2F9F6C6AE91B7419810508BA501C0148BF09 955BAD90D6391BA8EBA5CEFB23221CC75143D7
mPL73	DF071A10AC4120CD1431590BEDCFF9483CA7047B19590D035D309240BDB4264E9A3A2761402 EC97FD8BC51B4AF32E37FBC47162A2357D18751
mPL74	F0F952B2238139F46D8254D1A2C1C22A16BA71EC0C0C900ED1442452D7F44C798BC65FF4067 1B88074BA0B74C6510996EEAC495C5B49C37DEB
mPL75	1C86BD82EDA81FD65418D3837B5552A853791456D93B06C62C650D86CFBEC269AFFD772763 064062C03751B9428C6DA2E60383025F9E404B70
mPL76	B390978DD2552C88ABA7838489A6F5A8E9C41E95FFA2215819BF8A5BFE39C8A706CC658E5 49E966611B843A1468406C41C09D1560BEDA4F1B
mPL77	1A69EC9D053C7E84BAE7A48CCC71857D0C6B06D1065E3EA4633B133AA022B8104F6EE7C69B 6184B746C8822958B0A16686F27C8A0E3B4EFEAD
mPL78	C95B2070816DC97C6D8DD2583263E73F9AAAFD13F0548D2EBD835824418F11E54111005FB71 3AB234BE412347358281C7DE331EDD21B8BEA52
mPL79	56D6408399F23C2ED85EE0F68111D69A91A3AD9A732AC57CA08F86CC28B3CF4E4B02EBBA0 BCE5CAE5BACC4D52004070797C04093A84BB18DBA
mPL80	E662E7043867BE250764DA0596D34A582A619B408B505E6211DD6286E93A37F95B1EA680C0C 5F3E777E3F71E8D75495D59043217FC0E222E16
mPL81	27D5E681C222297AD478A079EF12F1A98F744B66335303322EF8880B931FEBF8322F4302944E 80BED468A0A516D410B183D863795992DA7DDB
mPL82	5100336C05F9E5BF35201906C1C588858E0DAF56130DF5554B9AB21CA15311A90290624CD63 E03F5EDA49DB7A0C32AB5F1CA427A2D5635FDA5
mPL83	C696DC993BFAEA9A61B781B9C5C3F5CFAA4C8339D8B03A9B0387883D0482A41AC78D652242 5959846E561D26A30FF79A205C801A85889736B2
mPL84	D562297561AFF42D3168296C1153E4E39BE7B2EB0348BC704625AA08391235075EE0DE0A79A B03222FEDB27218C56F96EAC2F91CC8FCE64B12
mPL85	DD0B6768FC01CC0A551F8ACC36907129623E975AB8B3FF58037F1859E2FA8C62C2D9D1E850 6916029A2C3F8CAD9A26AE2CC652F48800859F5C
mPL86	923920696EB3AB413786C41854822282BB83F6900D33A232D470BE198BBF086067B72613300C 593B74251E2F079857ADBBCD86583A9DCAA6DC
mPL87	B8EF30C797D8D2C4EF11244F137D806E556A436626D0115A621C92C34D166A68BCEDFA0040 DA8FD6F987B1CD5C2AA1C1B045E64475F0F8DABD
mPL88	E1887001D414405ED6419E9EE1D1D346D924ED57ADF04B31B7948099976B2D1501A60DFFB28 7AD44C8783DF0C1EA5AA5D273D1389C8EA22DCC
mPL89	8C2E379A58AA96748141CA84C35987905F984A49D3AD9BFF7807AC244C16C1DF74343C2E1F2 5514F5A0954CFBB3C92E25EF783136844998AC5
mPL90	78F8A99E0A54E27F51C0726FE7A11EB26B1E29FE65F55AC8AC58011465900B958488A90F6DF 614A58431DC8B6C6B9A6F032EE0E0B1306EC4B4
mPL91	88F7A31B7B20E0F05CA26E729B4F8A1933962D7BD7BE3E1EB130B28C794C0B4D01CADE0900 6FF97E80117509733F3A9DC225413A0AE08CA662
mPL92	BE4DFCEAC18905AC8D5DA27A794F88A4D3058D2EFA3B075A819DEAE688EAF8940A653ED71 04E7B403D490F0A9030264E1F12B8922C75775E61
mPL93	5BA4B79FC4550234D8922963BF3537485E3C8745A5DB90D3E2E454B30FF61112F508155B7C2B 3C4C628AF846240C2021ACDE547E5A41F666B8

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
mPL94	00556D35649F7610AB24A43C4F16D6AC0571FD126F11880C5CD72100D730E4E4D6BB73C33F8 37FAF1072743B249ADA2E09598B1EB23F1180A7
mPL95	7A0CC9F21BD69CF3023E944545C2176EF0D4F450B765C28359FB8A32137D043D0E5713E67B3 F61320985D2C6106605081F87D2296321468A2F
mPL96	DA669880995B0671201172BABFF141D5854A245E211879EF3038A7C84170DADBD368455F2465 3161E7886E15B253F93E3A3C568EFB17CDEB1A
mPL97	4E294E53D1661C1F6F748302A7723DA951C00FDB8BEBBF67A68710BA0F1A255DFB1627059D4 1A23D3961726DE6FEB10E5D209CC4505B209812
mPL98	73385DF701414E144768A67EF72924B1653479E962FB1554B7E54BC5284D9B3E41C0C133F878 972230721918AA425501B920B204FECE0C7F8A
mPL99	F4492160805F258CE592DF4D1200566F81D173458D78EA3ABED79A14AF88170DB1D4A9A5931 D2B80C58C27FE17D806E3E6A66CDAAD09F118D4
mPL100	44D562D9012D8B07B8F44596467C11A163982BB7EAEC184078B6B8CE46B5D7E17C39CEF57 6A025491183017FA09931D070B307B86524B03FF
mPL101	FCAEEFCC49A13B4FFA12C0CC6A2B90CF4F57D78B1E98294B04675C2F0991661FDC61A452A2 47F8C29E0284AA21026F368307375AA2C3F1E12C
mPL102	C486DF0510DCAD5AB86E178A686D398E11A0ECFAC5A326C10129257E5456B22FB8E147E919 0D9929A5DFFE44715FA47D62F04CFC9B1C201414
mPL103	C10AF383DC708E257E15A8AB337BCE684A2F4AC7A22DC2C25C277F8E8D0858E79317CDDD9 AA2EA6CBE604D24AC0945026103E7B4126FD361A4
mPL104	A5C60A181148D9A931B2DDDB9D169648BA54F366B4EFAE88F6861909EE0F07C037EE349D0E C59A823286E366CA3943589EEA7F828C3728085F
mPL105	96136AEBD5E28462B0421DF292BA899FFA660D80EA01620D2C7490E5347127884AA3C3D1FF4 4BCEE6C29EC589CDEF200C5742C5964F8B2B52
mPL106	40F63C04ACAD986255D1E16B769A6D4C11A1D075E804BDC0AC61923E9A67F5D741775632807 2455F6E22B1C64E06F367D1B0808295C2D90E22
mPL107	F4B82D413578C4888C5F002CF6D0E03778134A860436551FD57537E4CED334B3C9CEBACE615 238271717AA762448B86FA53D2074BCE35658A7
mPL108	BCCC92D72C920E685530591FC351743D1E23DE044BF81D32650406113E23ECC757FDE4E386 B6E2E7195EE4969717A7BD0812AC312B33A54308
mPL109	6ED59DE0D44370A861CE2B42CF5E578E764A682AB5777905EE027D7160490EDC6C28989B238 05AA697FC215CB401BC5E4D430624C01B16192
mPL110	DE80C0E273B92CC3C5034F7A20DB3914643C430B425C8B9249EAF73ACE8C3BCF17957242CF 534D87A67D4DC0252275262E737F4095450CFA14
mPL111	9505C4FEF2A397D5059F4729D013292A8321FFA929ACB0A210D0A13E13061227C44A68FBD8 CE6B66CE3D783363CD039AB35EE52603E09B758
mPL112	E8BE90D7F954B14D8002A4CAC20765ABEED80634498C836D79B0F9338DBC17B28F05CF4E79 136779E1C55AA30B6215F890882887B3B53C23E2
mPL113	9F4B622C1358AE5468DC31E4B2CA320E5E20458C1DE5405BF4F9AD7D45A5BCAA39EC0626FF FC698C16A009CCCB7A18A64E85E70BA71731BA24
mPL114	B91B2624843CF48299AFC2B1442570B41F28F578530D1E322E0B54282372131C71ACB924E707 68A243EEC3200E7A5EBFA77111D9FB07FEA8AE
mPL115	965F42DDA3A4650FE2F5103932B68F166FA424B9F0F7045311D962C2A9F66B9BC6C66FB480F 9800354E0C54A72251071422CF1DFC44F94C00C
mPL116	08ADCE48699FC30FA0788073BDAADB9177BBB4C1CED41F93085218364B8BAD8488561EF0FE 1B0DDAA403C602494CB35697D62AA0A2B93A64CF
mPL117	9A313BED80B1220D77C8ADA4B2E0B3D284A5120A94B741380923C78D3AD32BC3E71EC6EEA 520E9D447D8727697598BB987F17506F482003ABD
mPL118	24C9AD4C14EFEC002A3473FCAB04E492F2E269161A2960BA8AF09FD710B444A40C4E8B1384 18E62301E91FBA97AFDC58759A76D00F676736C7
mPL119	6514C7733711CE4942CD2123AB37186EB7FECB7E78ABB28744864942FCF4C0F810054AF55B1 042EB53064F0857C61D85B2CF0D2DC5826AF22F
mPL120	B2C80CDC83E48C36BC6FDAB8661208EAD392F3A0571BE41DFAD765E744932ADEA50061E66 C05498A5381B2A1F1B446587089DC4E4A2DF03D82
mPL121	639368BA75CC709A3D9F28EDA237E32C2017A9BF1E382045B9426AEE0A4049DCB4E1D7EBE4 647B855212824557497CFA039885A3BA42F98F63
mPL122	6A70DDC17D0C8024B1C853F0C1948561EF32510151BE0C63BCA9171F20217891D1021EE7258 6CAFF557F8973336913A94A2A699B8740B054B8
mPL123	2E32E3A35CCD001172CE310B63B4E406126045A0FA3795BE3E3D9B56F72405FC94FD8994681 8BAECD24A61BABB2E2D23052AB01EF73CA0CF4A
mPL124	829395C35205A480AC1351C25E234BF52D384A3DE1C5138A650A6F82F739757D812D9C38231 AB9FD81AA0648B11F6F6113F9312C57624FC746
mPL125	D98FFE19C0AAAAB0571A9075ECDFD3E7373F5255DC669116A8C6913F0123E598F930934C5F6 A601C37C529C371A0C391B59AC5A9E286D04011

Code ID	Basic Midamble Codes $m_{PL}$ of length $P=456$
$m_{PL126}$	C1A108192BCE96C2430A63C189BB33856BE6B8B524703FCB205DAEF37EF544CD43CA09B618 1B417398083FF2F781BA4AE89A5CA291DB928D71
$m_{PL127}$	42568DF9F61849BF9E7DEE750604BE2E0BC16CC464B1CDE15015E01D6498E9F3E6D6950E58 24651F212BA0057CE9529B9CCAB88D8136B8545E

## A.2 Basic Midamble Codes for Burst Type 2

In the case of burst type 2 (see subclause 5.2.2) the midamble has a length of  $L_m=256$ , which is corresponding to:

$K'=3$ ;  $W=64$ ;  $P=192$ .

Depending on the possible delay spread cells are configured to use  $K_{cell}$  midambles which are generated from the Basic Midamble Codes (see table A-2)

- for all  $k=1,2,\dots,K$ ;  $K=2K'$  or
- for  $k=1,2,\dots,K'$ , only.

The cell configuration is broadcast on BCH.

The mapping of these Basic Midamble Codes to Cell Parameters is shown in TS 25.223.

**Table A-2: Basic Midamble Codes  $m_p$  according to equation (5) from subclause 6.2.3 for case of burst type 2**

Code ID	Basic Midamble Codes $m_{PS}$ of length $P=192$
$m_{PS0}$	5D253744435A24EF0ECC21F43AA5B8144FBDB348C746080C
$m_{PS1}$	9D7174187201B5CE0136B7A6D85D39A9DD8D4B00E23835E4
$m_{PS2}$	AE90B477C294E55D28467476C6011029CDE29B7325DF0683
$m_{PS3}$	BC8A44125F823E51E568641EC12A6C68EAFDFA2350E3233C
$m_{PS4}$	898B7317B830D207C9BC7B521D5715680824DC08347B2943
$m_{PS5}$	466C7482C8827655BC13F479C7C1417290679A9841297C4A
$m_{PS6}$	AC0734C27C7DC1B818A8492744290DFE866B0EBA62B0B56E
$m_{PS7}$	0A92106325B15A8C15FC3764724CE67A5056D50A77F9360E
$m_{PS8}$	AE69F62E23035083E6094B89493D33E06FDB6532D473A280
$m_{PS9}$	B485D4E3614C9C373EA1365FA6FA890E9844084EBA90EB0C
$m_{PS10}$	66182885E2D28360D2FEAB842C65304FFC956CE8DC8A90C7
$m_{PS11}$	CC30A9B0A742FCC1E9A408415368391F1299AEA3CB6509FE
$m_{PS12}$	673928915886947F464FDDAAD29A07D182328EBC5839089A
$m_{PS13}$	4418861C14D62B46EE6D70D4BF05A3ED801A01BD6CDC5235
$m_{PS14}$	DAD62DC88F52F2D140062C2330BE6540E6F86192322AFB04
$m_{PS15}$	A2122BAF24529CEA9855FB43CE40923E7CA7B30D92E40702
$m_{PS16}$	6C44AB41E11F54B0929DF65673BD231F92A380132D9F1712
$m_{PS17}$	1DC2742E756CDA6421340D0087DD087A615E4B8688CB2F75
$m_{PS18}$	2E0105328B56E9E07D9B5A62F38B08AF8D8C2817B54F3302
$m_{PS19}$	88315EC30A94CA4EDB2C77079D9BD810A2E280B50DABB213
$m_{PS20}$	440E0093D28CB2B2B0A95D18CEB4AB934C33FA45C1CFC7B0
$m_{PS21}$	CC9BF85D41A96A6EC314F9611D5E1C0672556C8850801BB4
$m_{PS22}$	1ABEA04C99BC26972715F01957C0B6B959CC71CD88120817
$m_{PS23}$	EC5A33DA0BA4470442C5CB324A8E47B0A9F7968FC8108EE8
$m_{PS24}$	F82086290271DB446B5B1DC15D9BE96414B19B3D5E0F540C
$m_{PS25}$	11A1A790D6958FD3A9157DF1E05D1378248CA201EBCC7592
$m_{PS26}$	AA8564882231907BCE78092DC6C9DD4F5A0E4A34AFCFB809
$m_{PS27}$	912EE2238212F87BC7CDA7F30441ED184A6AA954EC4D20C8
$m_{PS28}$	2D200D8B8891B804673E380A1AF5AB875986E29D37D3FDC9
$m_{PS29}$	75E086B6C818423491BF9D6365C52FD1C5E42A576E268170
$m_{PS30}$	50ADBF27DA2A3701470186B699118E16DDB0D10F705607B1
$m_{PS31}$	656C0692B4E22023590A906D2A74DFD471C883A7B1E0B3A2
$m_{PS32}$	C21FDACD09A3CDCE74C4794010A3E45769B142505C56A0E6
$m_{PS33}$	CD9392A87C2D4D7CE5801CDDA8A76339B6F900F008B290E2

Code ID	Basic Midamble Codes m <sub>PS</sub> of length P=192
m <sub>PS</sub> 34	956426FEFD8B8D52073E87984E10C4D255064E1372C04A24
m <sub>PS</sub> 35	C4F4D6DF1B754AD6063FD10C331C1428ABB27B0700134B94
m <sub>PS</sub> 36	B65548082B34E9FAF43F33C4070F79099758CFD41B491A11
m <sub>PS</sub> 37	C8317EA111A82B04E78B88B864B1EF5D711BBEB4A0527036
m <sub>PS</sub> 38	8FB7AD1188E8D1A5219845013672560FD38904E70537403B
m <sub>PS</sub> 39	B41A324E0D80AA0598A8D391C1D7FFC82B4A075218E98EC3
m <sub>PS</sub> 40	49A6350A62E208B011E86528B9A481A0E76D723F6675FF82
m <sub>PS</sub> 41	C344C8C23C42A7B7442E6022E95AE4B08A4BFA786F35F911
m <sub>PS</sub> 42	28F430CF67D69C9DF60E25656413BC5F932A022DB1406C44
m <sub>PS</sub> 43	2FA5D70CF0FED4213F32116051450391C2A627D9B670C428
m <sub>PS</sub> 44	959537D988FDD4F1360B4E84701AE5409229C30EDF8BC404
m <sub>PS</sub> 45	CDD2E0450F9EC12F81391AD4633CB29F315B4A0A890A9A22
m <sub>PS</sub> 46	158776A20B4B82C563EC08F086830EA66DBD2DCCB4DF6026
m <sub>PS</sub> 47	431FCACBE48208975950342709D11F19AD5FB047F3B440C9
m <sub>PS</sub> 48	86B141AC571BA6B42653B12FF04D4F0E6C81F3EB608660A2
m <sub>PS</sub> 49	86D297ABD34E8510F6CDB0EA617F1F1051C8799117B02211
m <sub>PS</sub> 50	80B2D9530B34E781311D95CFA3857F277CC07014D324AF5A
m <sub>PS</sub> 51	2B607B93FD8B45601C1E574E14CFC6912C22AEC1045ADC49
m <sub>PS</sub> 52	D234C5C45E105A837E6DD74BC4E534523A20317BA0625A29
m <sub>PS</sub> 53	768CCDB3E2A7A2B863128382590946B25472BE2BFFC40641
m <sub>PS</sub> 54	3DA38212E0A987EE1F665D4E13C2AA4446E00A76C948A073
m <sub>PS</sub> 55	09173135E4A2CFC8F2678750AB5257110906F013587BDE82
m <sub>PS</sub> 56	522E070B266F35E99C1F3C42D2017F8E415550492B72F086
m <sub>PS</sub> 57	D63E4BD805262A3DEF05C7D86C422E5048921E5531784132
m <sub>PS</sub> 58	564AF806E28131611E5F884229265D446A50E1E488EAFBBA
m <sub>PS</sub> 59	A2603E009D3D30147727B750C35C62299AF754D3E4A54E1C
m <sub>PS</sub> 60	938504B02599D33E28246E4271C375AE81A3BBE8D3F8A920
m <sub>PS</sub> 61	461516B2CAC6FC42A4B707CC6073BBE573C014892C811776
m <sub>PS</sub> 62	29186DE4CCAAB2CD0100BB19EA595879D63F0F0CFA881AA5
m <sub>PS</sub> 63	A064B449CB784A91B803369CDC5EF61A670AAC044BA3E68
m <sub>PS</sub> 64	8719C454D88FF5149DB943CB6CADA01D0B9664B357A18203
m <sub>PS</sub> 65	A27EC68720F00A714AA2C45A7EF232286984D7B193F5C916
m <sub>PS</sub> 66	AC8361676AB424E48F0789082B0CD2EFB8D2E627D041DD66
m <sub>PS</sub> 67	ABA1BEB0064733A0620906BF2B29C95883F069D7E4C35D39
m <sub>PS</sub> 68	9E22EEDED47D92CA1D0B7530EC6062287BD83A04874AE00C
m <sub>PS</sub> 69	0BADEF288B20F5686C5DE3A71219AC2172054326BE831696
m <sub>PS</sub> 70	953801EB2AF58C2F80E49A6CC46085CB554243E3B3BBEC8C
m <sub>PS</sub> 71	333A504C51C8FAC5025994565C3F600F154F64FAEF4EA484
m <sub>PS</sub> 72	A6583E19647662005474153A6F8DD88A473853E94B720CE7
m <sub>PS</sub> 73	90ACAF707D18AF34F5848C58166830AF620ACDC1B2DFDDA8
m <sub>PS</sub> 74	39C5C598A374EA82F3F83378258248DAD3808812DD0E74BB
m <sub>PS</sub> 75	F79525DE694629346D73F6256CC0F140F82603197AAA1844
m <sub>PS</sub> 76	B8C2A8F139097699A693022E78588D4058DB0A65FF52F813
m <sub>PS</sub> 77	449B50C2A52996FA5A828A907F30F9F460EE3D99930DF890
m <sub>PS</sub> 78	62CEC9574D30184BCB4F94EECF0CC23D2D2A8D0003F0AA33
m <sub>PS</sub> 79	B56D258889703F76A0738EE3A7D355994159A4851833E198
m <sub>PS</sub> 80	65894AA54C0F6C9A206521C9FC379A8AAF6E621C03CF849C
m <sub>PS</sub> 81	2D47F3414E30CC02C6835D95C9BA204488F0FFCB4852677D
m <sub>PS</sub> 82	12BE4DD8B906B584010F8A330AB67B278E8642FA33D51B68
m <sub>PS</sub> 83	BC928A90A4B10906CAEE638BF768E08542F48F1676006DF0
m <sub>PS</sub> 84	30C544E437C8ADA143566CD1BC4E9E7BA84139A08505C2F4
m <sub>PS</sub> 85	84FD5B05506192B753FBA2C719B584E0EDA01814999867D2
m <sub>PS</sub> 86	191F14DD00034E03AB5BB4342F1138B2CD33784E60CFD75A
m <sub>PS</sub> 87	B8ACE7990B6A98A80A61162C4D2D5F88F24E8F7DE4207590
m <sub>PS</sub> 88	EC1DBE72E8EED0C61054FC2695422AC0AD2D888265B21AB0
m <sub>PS</sub> 89	9A1B4CA467AB7E082AF4278E44D177EA78424508C23E8B08
m <sub>PS</sub> 90	999EE541C608164AC975214F3A37A677FC2CA03E2C2A4B20
m <sub>PS</sub> 91	1BDCC20265031432917A2EB828FB356A22DF9CB609C0F8F3
m <sub>PS</sub> 92	EB4A81859C93338B8A1B87C02C815AE09D765F6F2249B958
m <sub>PS</sub> 93	E6A5D1629F4CF09A1F280DE0C480D4C73B26ADE321A50AEE
m <sub>PS</sub> 94	BAAB7286DD24C80B15A7958039B904F1CA83C310C8C7AFF2
m <sub>PS</sub> 95	12220F72619E983717C68FFE1C4148F2354B7B1955B65620
m <sub>PS</sub> 96	A198706E24FAA08BD09EE392414816038E667BB34307D6B2

Code ID	Basic Midamble Codes $m_{PS}$ of length $P=192$
m <sub>PS</sub> 97	30B3493B4C035881A7A722E4546527AAE787FA2C0893AC46
m <sub>PS</sub> 98	5A7318126522843DCB7F00A2D9F9BA8F88963E4152BC923C
m <sub>PS</sub> 99	844844B0CACAB702C332CE2692B4166F4B0C63E62BF151BF
m <sub>PS</sub> 100	B8297389526410313692F861DC60DA86A23607F7DDE24755
m <sub>PS</sub> 101	6C1144CF8BC01538D655D29ED62DE6E74A3180EC905BF1E0
m <sub>PS</sub> 102	E9DB3221FACFC5C88691A7013EF09672A130D52C3413AAE2
m <sub>PS</sub> 103	2FD0508615EC4CD4BF18ADD46D777078869130C8921A4F0E
m <sub>PS</sub> 104	40911B4E0525AC874228F6EF642E59154730CB187C7E417A
m <sub>PS</sub> 105	2034C6A027D4D850F5184AA64C3153231F4651B616BBFCF9
m <sub>PS</sub> 106	57833235451525A1DFA213FCE0B419B6494BC7B99F488410
m <sub>PS</sub> 107	6DC3D57F2E39158D036825F8804810D77CA1ECA610ECD894
m <sub>PS</sub> 108	F5C50DE43AA7B731CAB7683524021701F97650499A7070E4
m <sub>PS</sub> 109	F2184D2699785442E09FA22CC2D60A5A13FFF22AE660A470
m <sub>PS</sub> 110	EF0029DE0D79207205458CF4D7328E81A93518D93C9A74BD
m <sub>PS</sub> 111	9D6D8992482FB885AA5E878C3BA2045538B09886C23CDC2D
m <sub>PS</sub> 112	C0A5AB67D1CEA126F6476C75443F0A11CBE749412EF03104
m <sub>PS</sub> 113	1853A5C20CDF968C5A180D8EB5E72BF15517D06680D98412
m <sub>PS</sub> 114	8CEA1223227ADF37D0DAAB320906E1C79029F480D25181A7
m <sub>PS</sub> 115	5561038E96A658EF3EC665612FF92B064065D1ACC1F54812
m <sub>PS</sub> 116	C55A6263F08D664A1E53584560DFF5E611640D8281D9A843
m <sub>PS</sub> 117	4386A8EA59124D043F29056A4598735A4FC7BC11119B90C1
m <sub>PS</sub> 118	D6571B20668BED50BD7C80388C162632BCB069AA67C7FC22
m <sub>PS</sub> 119	4F9F09ABBC1391EC2CCA5359FB52250E533BF04324154106
m <sub>PS</sub> 120	662659F42188C9453F6E6DF00C579627045DA1461A3A0EA5
m <sub>PS</sub> 121	8DCC9274C0C2A9BA6096BF27FACA542CD01CA8653D60A80F
m <sub>PS</sub> 122	5C1210A1E50E505F6B73C90156C9D9F19AE2310BBD820DF0
m <sub>PS</sub> 123	B1E0A7CE26202E223D4FC06D5C9BBA4E5F6D98204D2D5286
m <sub>PS</sub> 124	DB506776958E34552F7E60E4B400D836153218F918E22FA6
m <sub>PS</sub> 125	ECAA60300439B2360B2AC3C43FB6241ACDE5055B295FA71C
m <sub>PS</sub> 126	BF1E6D9AA9CA4AC092BE60500C77D0DC7A6A236520F86722
m <sub>PS</sub> 127	051C5FA122845A30B4EC306B38016B45667C7754F92F13A0

## A.3 Association between Midambles and Channelisation Codes

The following mapping schemes apply for the association between midambles and channelisation codes if no midamble is allocated by higher layers. Secondary channelisation codes are marked with a (\*). These associations apply both for UL and DL.

### A.3.1 Association for Burst Type 1/3 and $K_{Cell} = 16$ Midambles

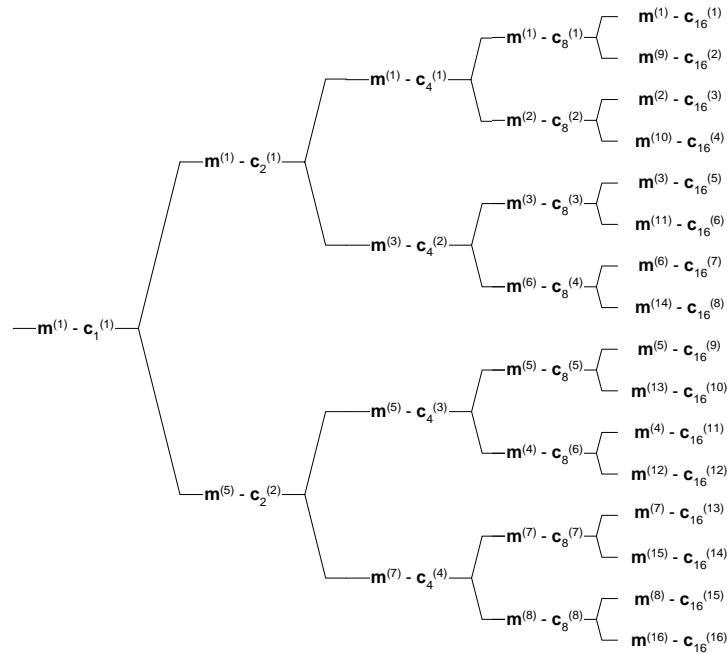
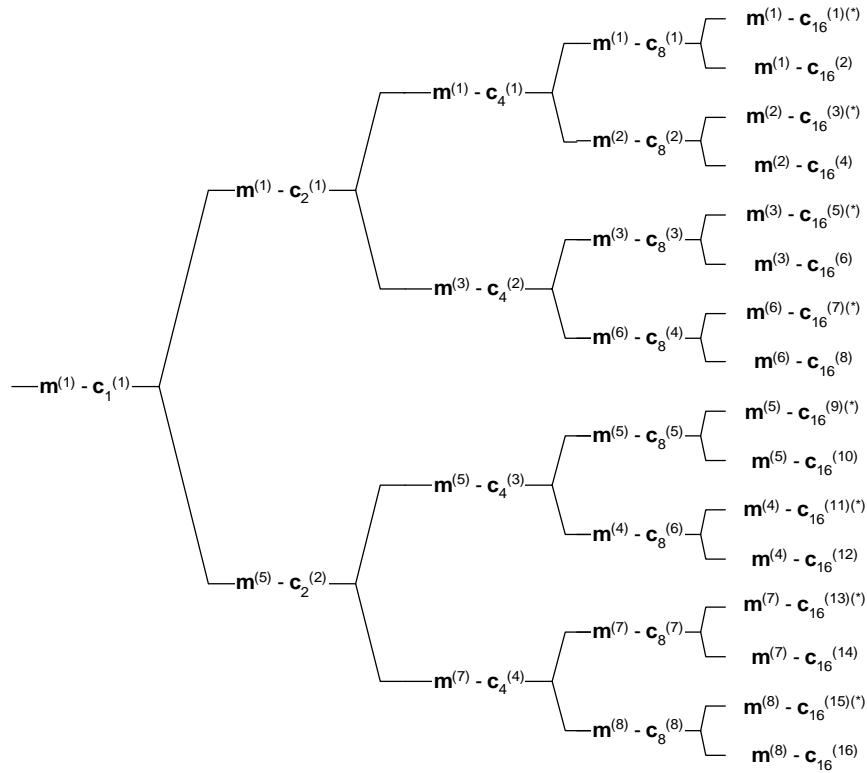


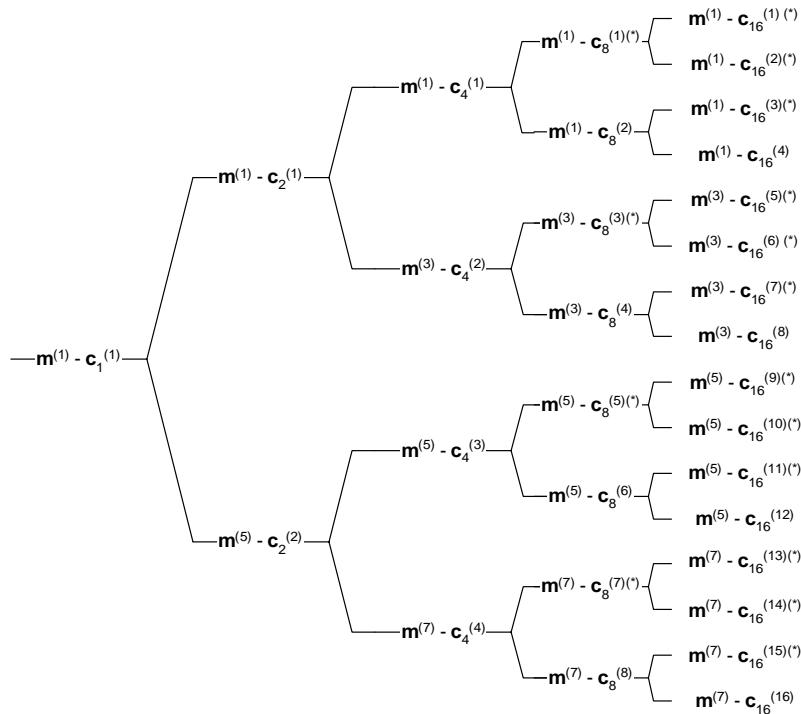
Figure A-1: Association of Midambles to Spreading Codes for Burst Type 1/3 and  $K_{Cell} = 16$

### A.3.2 Association for Burst Type 1/3 and $K_{Cell}=8$ Midambles



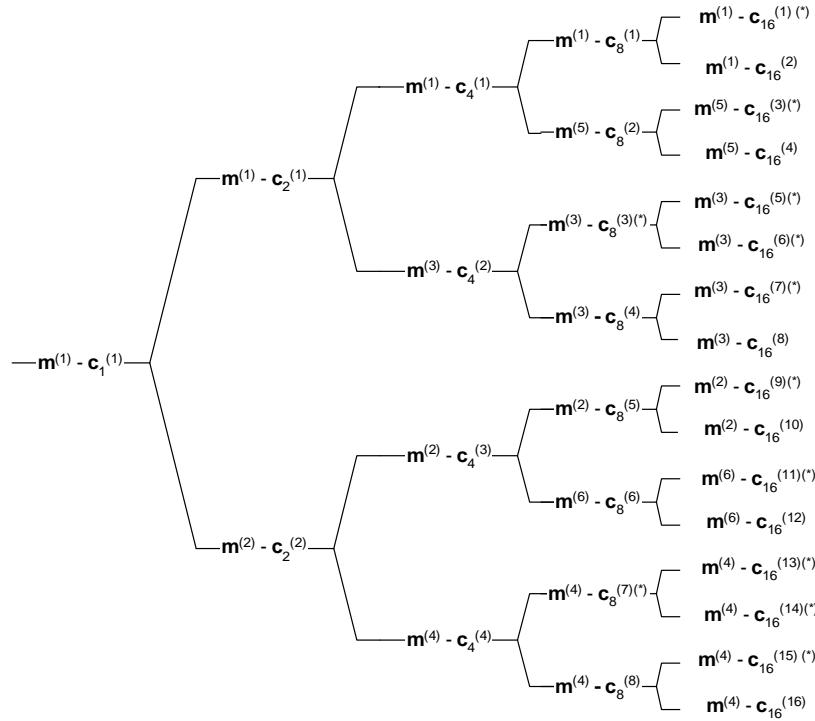
**Figure A-2: Association of Midambles to Spreading Codes for Burst Type 1/3 and  $K_{Cell}=8$**

### A.3.3 Association for Burst Type 1/3 and $K_{Cell}=4$ Midambles



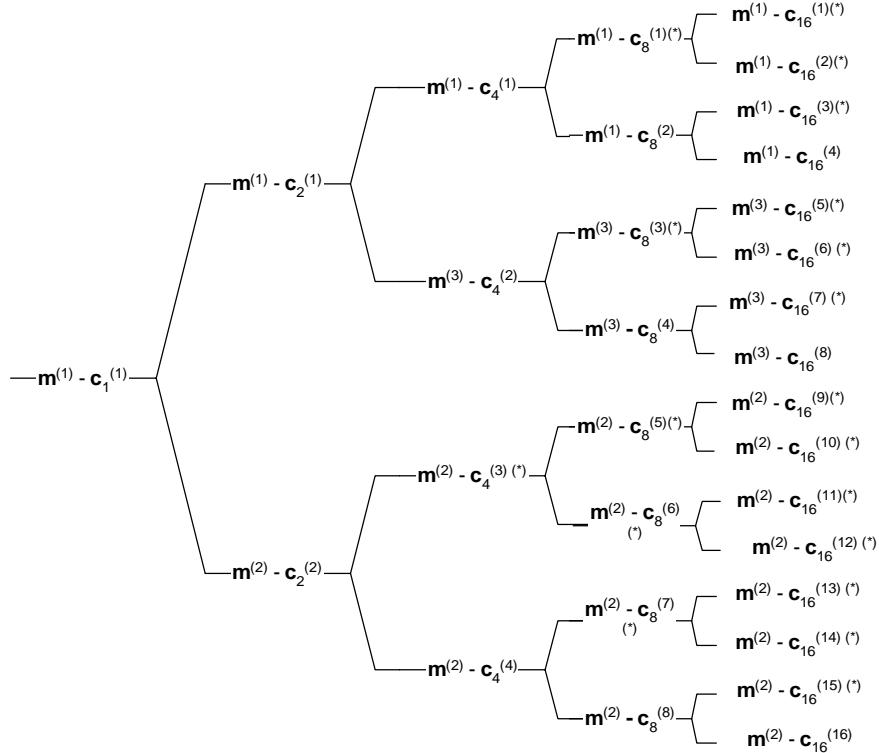
**Figure A-3: Association of Midambles to Spreading Codes for Burst Type 1/3 and  $K_{Cell}=4$**

### A.3.4 Association for Burst Type 2 and $K_{Cell} = 6$ Midambles



**Figure A-4: Association of Midambles to Spreading Codes for Burst Type 2 and  $K_{Cell} = 6$**

### A.3.5 Association for Burst Type 2 and $K_{Cell} = 3$ Midambles



**Figure A-5: Association of Midambles to Spreading Codes for Burst Type 2 and  $K_{Cell} = 3$**

Note that the association for burst type 2 can be derived from the association for burst type 1 and 3, using the following table:

Burst Type 1/3	m(1)	m(2)	m(3)	m(4)	m(5)	m(6)	m(7)	m(8)
Burst Type 2	m(1)	m(5)	m(3)	m(6)	m(2)	m(4)	-	-

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## Annex B (normative): Basic Midamble Codes for the 1.28 Mcps option

### B.1 Basic Midamble Codes

The midamble has a length of  $L_m=144$ , which is corresponding to:

$$K=2, 4, 6, 8, 10, 12, 14, 16, \quad W = \left\lfloor \frac{P}{K} \right\rfloor, P=128$$

Note: that  $\lfloor x \rfloor$  denotes the largest integer number less or equal to  $x$ .

Depending on the possible delay spread cells are configured to use midambles which are generated from the Basic Midamble Codes (see table B.1). The cell configuration is broadcast on BCH.

The mapping of these Basic Midamble Codes to Cell Parameters is shown in [8].

**Table B.1: Basic Midamble Codes  $m_p$  according to equation (5) from subclause 6.2.3**

<b>Code ID</b>	<b>Basic Midamble Codes <math>m_p</math> of length P=128</b>
$m_{P0}$	B2AC420F7C8DEBFA69505981BCD028C3
$m_{P1}$	0C2E988E0DBA046643F57B0EA6A435E2
$m_{P2}$	D5CEC680C36A4454135F86DD37043962
$m_{P3}$	E150D08CAC2A00FF9B32592A631CF85B
$m_{P4}$	E0A9C3A8F6E40329B2F2943246003D44
$m_{P5}$	FE22658100A3A683EA759018739BD690
$m_{P6}$	B46062F89BB2A1139D76A1EF32450DA0
$m_{P7}$	EE63D75CC099092579400D956A90C3E0
$m_{P8}$	D9C0E040756D427A2611DAA35E6CD614
$m_{P9}$	EB56D03A498EC4FEC98AE220BC390450
$m_{P10}$	F598703DB0838112ED0BABB98642B665
$m_{P11}$	A0BC26A992D4558B9918986C14861EFF
$m_{P12}$	541350D109F1DD68099796637B824F88
$m_{P13}$	892D344A962314662F01F9455F7BC302
$m_{P14}$	49F270E29CCD742A40480DD4215E1632
$m_{P15}$	6A5C0410C6C39AA04E77423C355926DE
$m_{P16}$	7976615538203103D4DBCC219B16A9E1
$m_{P17}$	A6C3C3175845400BD2B738C43EE2645F
$m_{P18}$	A0FD56258D228642C6F641851C3751ED
$m_{P19}$	EFA48C3FC84AC625783C6C9510A2269A
$m_{P20}$	62A8EB1A420334B23396E8D76BC19740
$m_{P21}$	9E96235699D5D41C9816C921023BC741
$m_{P22}$	4362AE4CAE0DCC32D60A3FED1341A848
$m_{P23}$	454C068E6C4F190942E0904B95D61DFB
$m_{P24}$	607FEEA6E2E99206718A49C0D6A25034
$m_{P25}$	E1D1BCDA39A09095B5C81645103A077C
$m_{P26}$	994B445E558344DE211C8286DDD3D1A3
$m_{P27}$	C15233273581417638906ADB61FDCA3C
$m_{P28}$	8B79A274D542F096FB1388098230F8A1
$m_{P29}$	DF58AC1C5F44B2A40266385CE1DA5640
$m_{P30}$	B5949A1CC69962C464401D05FF5C1A7A
$m_{P31}$	85AC489841ED3EAA2D83BBB0039CC707
$m_{P32}$	AE371CC144BC95923CA8108D8B49FE82
$m_{P33}$	7F188484A649D1C22BDA1F09D49B5117
$m_{P34}$	ADAA3C657089DEF7C0284903A491C9B0
$m_{P35}$	C3F96893C7504DC3B51488604AF64F4C
$m_{P36}$	B4002F5AE0CE8623AC979D368E9148C1
$m_{P37}$	0EEBBC0C795C02A106C24ABB36D08C6E
$m_{P38}$	4B0F537E384A893F58971580D9894433
$m_{P39}$	08E0035AB29B7ECC53C15DAA0687CC8F
$m_{P40}$	8611ACBC4C82781D77654EE862506D60
$m_{P41}$	63315261A8F1CB02549802DBFD197C07
$m_{P42}$	9A2609A434F43E7DCADC0E22B2EF4012
$m_{P43}$	F4C9F0A127A88461209ABF8C69CE4D00
$m_{P44}$	C79124EE3FFC28C5C4524D2B01670D42
$m_{P45}$	C91985C4FED53D09361914354BA80E79
$m_{P46}$	82AA517260779ECFF26212C1A10BDC29
$m_{P47}$	561DE2040ACB458E0DBD354E43E111D9
$m_{P48}$	2E58C7202D17392BC1235782CEFABB09
$m_{P49}$	C4FAA121C698047650F6503126A577C1
$m_{P50}$	E7B75206A9B410E44346E0DAE842A23C
$m_{P51}$	3F8B1C32682B28D098D3805ED130EA7F
$m_{P52}$	8D5FC2C1C6715F824B401434C8D4BB82
$m_{P53}$	0B2A43453ACC028FE6EB6E1CB0740B59
$m_{P54}$	BC56948FC700BA488326EE73E12D82A
$m_{P55}$	558D136710272912FA4F183D1189A7FD
$m_{P56}$	5709E7F82DC6500B7B12A3072D182645
$m_{P57}$	86D4F161C844AE5E20EE39FD5493B044
$m_{P58}$	8729B6EDC382B152185885F013DAE222
$m_{P59}$	154C45B50720F4C362C14C77FE8335A1
$m_{P60}$	C6A0962890351F4EB802DE43A7662C9E

m <sub>P61</sub>	D19D69D6B380B4B22457CB80033519F0
m <sub>P62</sub>	C7D89509FB0DAE9255998E0A00C2B262
m <sub>P63</sub>	DFD481C652C0C905D61D66F1732C4AA2
m <sub>P64</sub>	06C848619AF1D6C910A8EAC4B622FC06
m <sub>P65</sub>	0635E29D4E7AC8ABC189890241F45ECA
m <sub>P66</sub>	B272B020586AAD7B093AC2F459076638
m <sub>P67</sub>	B608ACE46E1A6BC96181EEDD88B54140
m <sub>P68</sub>	0A516092B3ED7849B168AFE223B8670E
m <sub>P69</sub>	D1A658C5009E04D0D7D5E9205EE663E8
m <sub>P70</sub>	AC316DC39B91EB60B1AABD8280740432
m <sub>P71</sub>	E3F06825476A026CD287625E514519FC
m <sub>P72</sub>	A56D092080DDE8994F387C175CC56833
m <sub>P73</sub>	15EA799DE587C506D0CD99A408217B05
m <sub>P74</sub>	A59C020BAB9AF6D3F813C391CA244CD2
m <sub>P75</sub>	74B0101EB9F3167434B94BABC8378882
m <sub>P76</sub>	CE752975C8DA9B0100386DB82A8C3D20
m <sub>P77</sub>	BBB38DCDB1E9118570AC147DC05241A4
m <sub>P78</sub>	944ABBF0866098101F6971731AB2E986
m <sub>P79</sub>	2BB147B2A30C68B4853F90481A166EB6
m <sub>P80</sub>	444840ACCF3F23C45B56D7704BF18283
m <sub>P81</sub>	87604F7450D1AD188C452981A5C7FC9B
m <sub>P82</sub>	8C3842EBC948A65BC4C8B387F11B7090
m <sub>P83</sub>	10B4767D071CF5DB2288E4029576135A
m <sub>P84</sub>	6F07AAB697CD0089572C6B062E2018E4
m <sub>P85</sub>	D3D65B442057E613A8655060C8D29E27
m <sub>P86</sub>	5EDA330514C604BF4E0894E09EC57A74
m <sub>P87</sub>	B0899CD094060724DED82AE85F18A43A
m <sub>P88</sub>	B2D999B86DF902BC25015CAE3A0823C4
m <sub>P89</sub>	C23CD40F04242B92D46EED82CD9A9A18
m <sub>P90</sub>	D22DDCC5CB82960125DD24655F3C8788
m <sub>P91</sub>	54987218FBD99AE4340FD4C9458E9850
m <sub>P92</sub>	BE4341822997A7B11EA1E8A1A2767005
m <sub>P93</sub>	255200FBA6EE48E6DE0A82B0461B8D0F
m <sub>P94</sub>	6FBD58A663932423503690CF9C171701
m <sub>P95</sub>	D215033A4AA87EC1C232BAC7EDA09370
m <sub>P96</sub>	CA0959B01AE48E80204F1E4A3F29CE55
m <sub>P97</sub>	582043413B9B825903E3A3545ED59463
m <sub>P98</sub>	5016541922971C703D16E284CBDF633B
m <sub>P99</sub>	7347EF160A1733CA98D43608A83A920B
m <sub>P100</sub>	908B22AD433CCA00B3FD47C691F1A290
m <sub>P101</sub>	BB22A272FC6923DF1B43BA4118806570
m <sub>P102</sub>	0FA75C87474836B47DC7624D61193802
m <sub>P103</sub>	A22EBA0658A4D0FF1E9CA5030A65CC06
m <sub>P104</sub>	6C9C51CA15F1F4981F4C46180A6A6697
m <sub>P105</sub>	4C847ACF8BC15359C405322851C9BDE2
m <sub>P106</sub>	C1D29499C0082C9DE473ED15B14D63E0
m <sub>P107</sub>	7E85ECC98AC761005076C5572869A431
m <sub>P108</sub>	D8F11121595B8F49F78A7039E44126A0
m <sub>P109</sub>	1A0BC814445FD71C8E5B1A9163ED2059
m <sub>P110</sub>	A7591F27F8B0C00C68CC41697954FA04
m <sub>P111</sub>	6CA2CE595E7406D79C4840183D41B9D0
m <sub>P112</sub>	C093D3CC701FC20E66F5AB22516C5460
m <sub>P113</sub>	D0E0CDE9B595546B96C4F8066B469020
m <sub>P114</sub>	E99F743A451431C8B427054A4E6F2007
m <sub>P115</sub>	C0D21A344A2C07DF2A6EBE6250C7B91E
m <sub>P116</sub>	F031223E282CF7A4D8EF174A908668AE
m <sub>P117</sub>	E4BD244AC16C55C7137FB068FD44280C
m <sub>P118</sub>	C44920DE2028F19FC2AAB36A0DCFDAD0
m <sub>P119</sub>	3FA7054E77135250699E6C8A11600742
m <sub>P120</sub>	D5740B4D8870C1C5B5A214C4266FC537
m <sub>P121</sub>	F0B7942D43BB6F38446442EB8126AB80
m <sub>P122</sub>	83DB9534EAD6238FA8968798CDF04848
m <sub>P123</sub>	EB9663CDDC2B291690703125BABC800
m <sub>P124</sub>	84D547225D4BBD20DEF1A583240C6E0F

m <sub>P125</sub>	B51F6A771838BE934724AEA6A2669802
m <sub>P126</sub>	D92AC05E10496794BBDC115233B1C068
m <sub>P127</sub>	D3ACF0078EDA9856BBB0AF8651132103

## B.2 Association between Midambles and Channelisation Codes

The following mapping schemes apply for the association between midambles and channelisation codes if no midamble is allocated by higher layers. Secondary channelisation codes are marked with (\*). These associations apply for both UL and DL.

### B.2.1 Association for K=16 Midambles

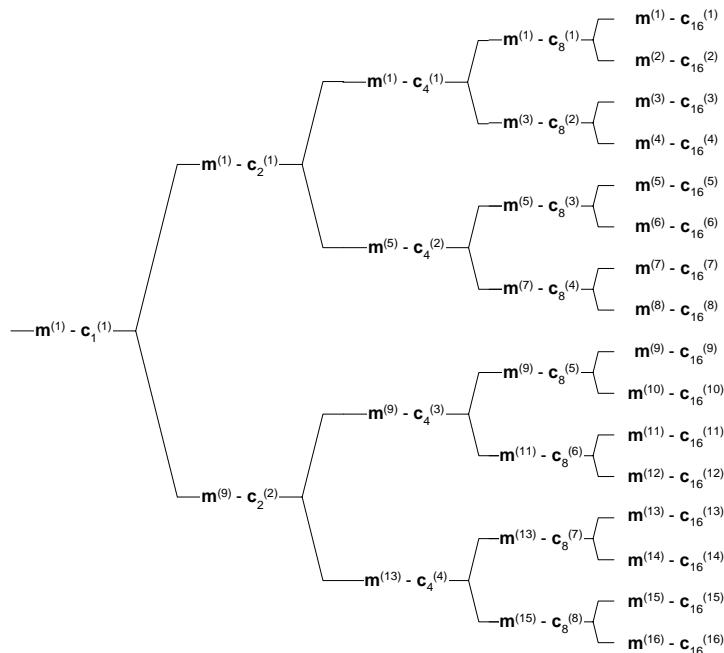


Figure B.2.1: Association of Midambles to Spreading Codes for K=16

## B.2.2 Association for K=14 Midambles

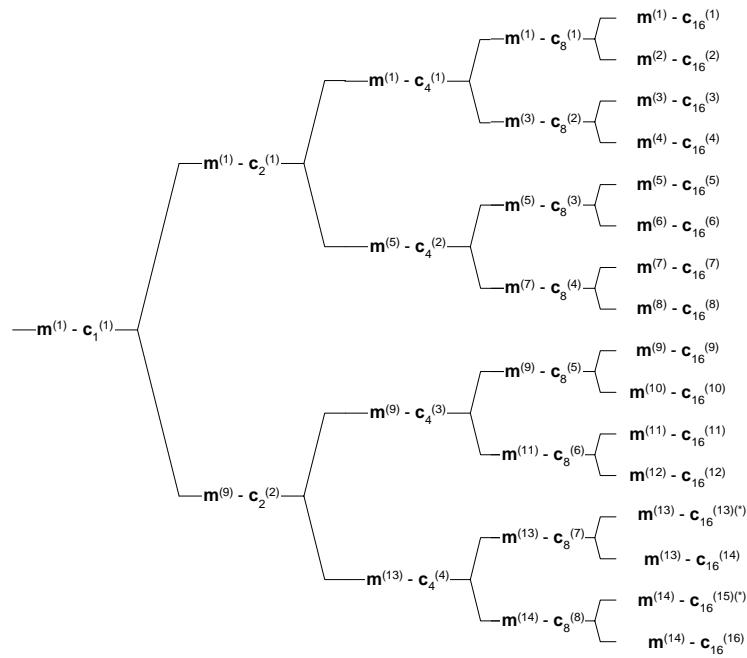


Figure B.2.2: Association of Midambles to Spreading Codes for K=14

## B.2.3 Association for K=12 Midambles

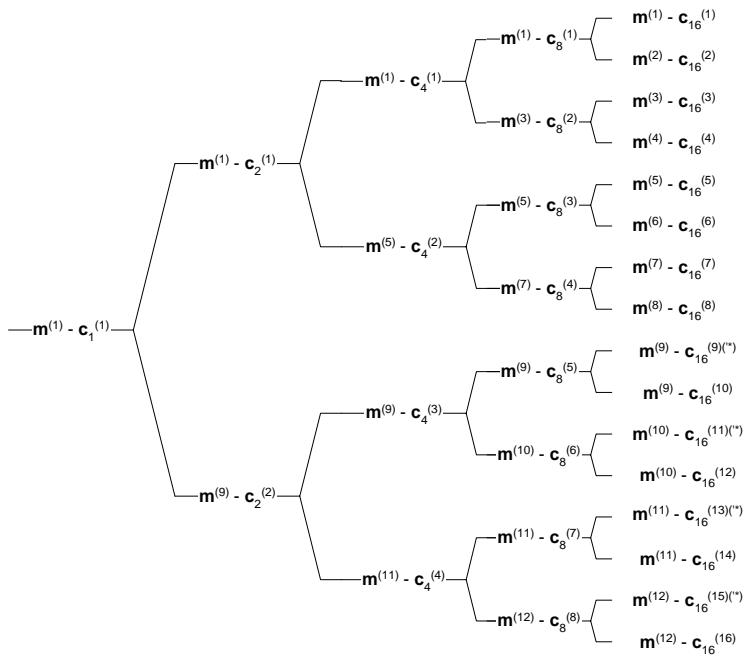


Figure B.2.3: Association of Midambles to Spreading Codes for K=12

## B.2.4 Association for K=10 Midambles

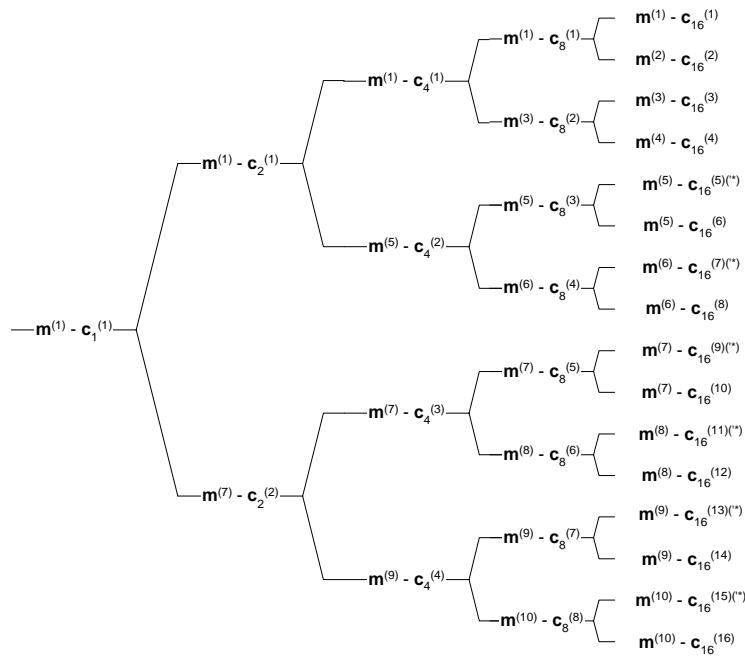


Figure B.2.4: Association of Midambles to Spreading Codes for K=10

## B.2.5 Association for K=8 Midambles

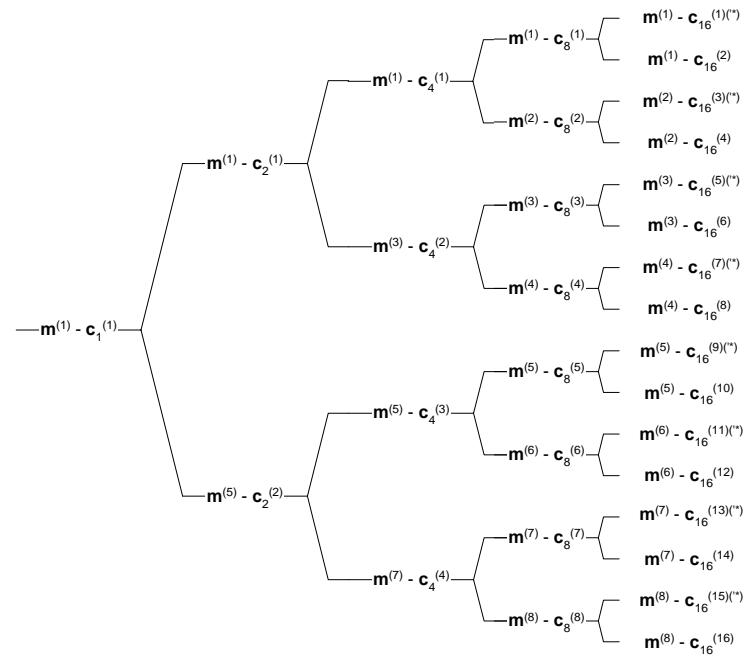


Figure B.2.5: Association of Midambles to Spreading Codes for K=8

## B.2.6 Association for K=6 Midambles

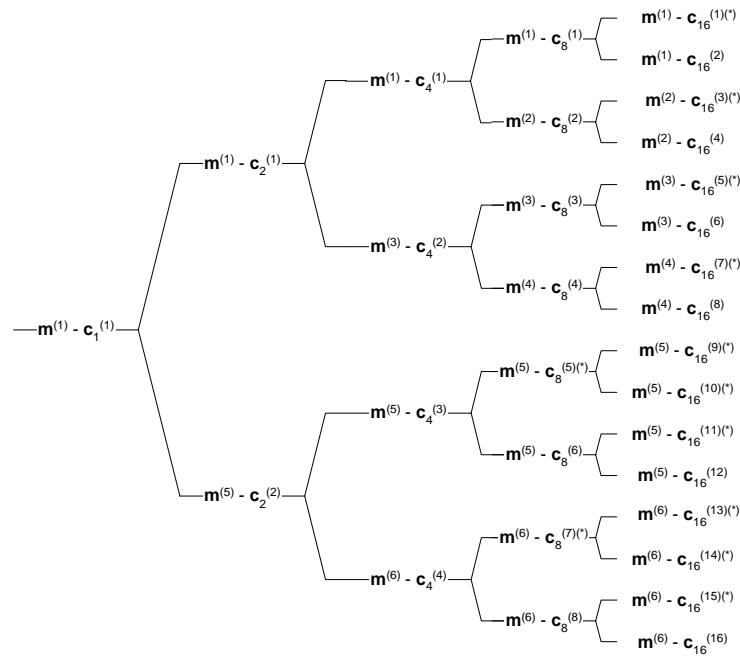


Figure B.2.6: Association of Midambles to Spreading Codes for K=6

## B.2.7 Association for K=4 Midambles

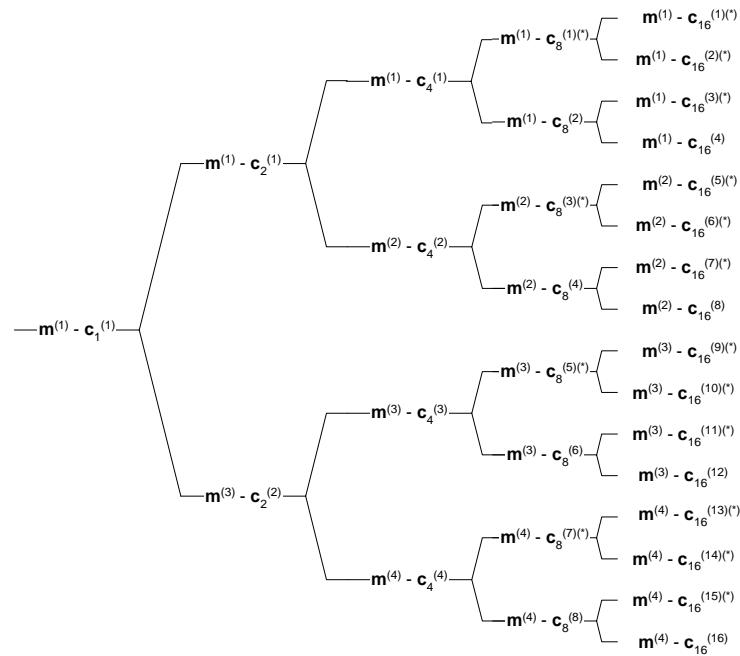
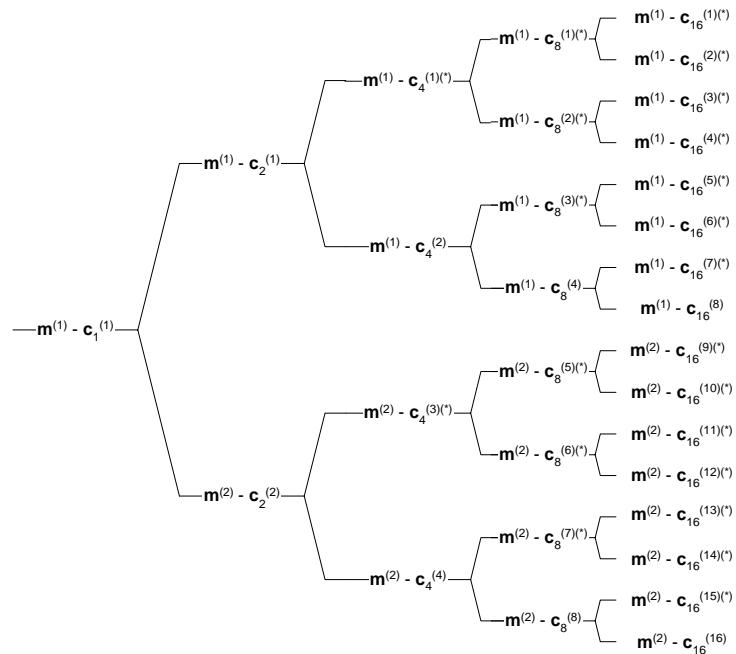


Figure B.2.7: Association of Midambles to Spreading Codes for K=4

## B.2.8 Association for K=2 Midambles



**Figure B.2.8: Association of Midambles to Spreading Codes for K=2**

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## Annex C (normative):

### Signalling of the number of channelisation codes for the DL common midamble case for 3.84Mcps TDD

The following mapping schemes shall apply for the association between the number of channelisation codes employed in a timeslot and the use of a particular midamble shift in the DL common midamble case. In the following tables the presence of a particular midamble shift is indicated by ‘1’. Midamble shifts marked with ‘0’ are left unused. Mapping schemes B.3 and B.4 are not applicable to beacon timeslots where a P-CCPCH is present, because the default midamble allocation scheme is applied to these timeslots. Note that in mapping schemes B.3 and B.4, the fixed and pre-allocated channelisation code for the beacon channel is included into the number of indicated channelisation codes.

---

## C.1 Mapping scheme for Burst Type 1 and $K_{Cell} = 16$ Midambles

m1	m2	m3	m4	m5	m6	m7	M8	m9	m10	m11	m12	m13	m14	m15	m16	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 code
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 codes
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3 codes
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4 codes
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5 codes
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6 codes
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	7 codes
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8 codes
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	9 codes
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	10 codes
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	11 codes
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12 codes
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	13 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	14 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	16 codes

---

## C.2 Mapping scheme for Burst Type 1 and $K_{Cell} = 8$ Midambles

M1	m2	m3	m4	m5	m6	m7	m8	
1	0	0	0	0	0	0	0	1 code or 9 codes
0	1	0	0	0	0	0	0	2 codes or 10 codes
0	0	1	0	0	0	0	0	3 codes or 11 codes
0	0	0	1	0	0	0	0	4 codes or 12 codes
0	0	0	0	1	0	0	0	5 codes or 13 codes
0	0	0	0	0	1	0	0	6 codes or 14 codes
0	0	0	0	0	0	1	0	7 codes or 15 codes
0	0	0	0	0	0	0	1	8 codes or 16 codes

---

### C.3 Mapping scheme for Burst Type 1 and $K_{Cell}=4$ Midambles

m1	m3	m5	m7	
1	0	0	0	1 or 5 or 9 or 13 codes
0	1	0	0	2 or 6 or 10 or 14 codes
0	0	1	0	3 or 7 or 11 or 15 codes
0	0	0	1	4 or 8 or 12 or 16 codes

---

### C.4 Mapping scheme for beacon timeslots and $K_{Cell}=16$ Midambles

m1	m2	m3	M4	m5	m6	m7	M8	m9	m10	m11	M12	m13	m14	m15	m16	
1	x <sup>(*)</sup>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1 codes or 13 codes
1	x <sup>(*)</sup>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2 codes or 14 codes
1	x <sup>(*)</sup>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3 codes or 15 codes
1	x <sup>(*)</sup>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4 codes or 16 codes
1	x <sup>(*)</sup>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5 codes
1	x <sup>(*)</sup>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	8 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	9 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	10 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	11 codes
1	x <sup>(*)</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12 codes

<sup>(\*)</sup> In case of Block-STTD encoding for the P-CCPCH, midamble shift 2 is used by the diversity antenna

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### C.5 Mapping scheme for beacon timeslots and $K_{Cell}=8$ Midambles

m1	m2	m3	m4	m5	m6	m7	M8	
1	x <sup>(*)</sup>	1	0	0	0	0	0	1 or 7 or 13 codes
1	x <sup>(*)</sup>	0	1	0	0	0	0	2 or 8 or 14 codes
1	x <sup>(*)</sup>	0	0	1	0	0	0	3 or 9 or 15 codes
1	x <sup>(*)</sup>	0	0	0	1	0	0	4 or 10 or 16 codes
1	x <sup>(*)</sup>	0	0	0	0	1	0	5 codes or 11 codes
1	x <sup>(*)</sup>	0	0	0	0	0	1	6 codes or 12 codes

<sup>(\*)</sup> In case of Block-STTD encoding for the P-CCPCH, midamble shift 2 is used by the diversity antenna

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### C.6 Mapping scheme for beacon timeslots and $K_{Cell}=4$ Midambles

m1	m3	m5	m7	
1	1	0	0	1 or 4 or 7 or 10 or 13 or 16 codes
1	0	1	0	2 or 5 or 8 or 11 or 14 codes
1	0	0	1	3 or 6 or 9 or 12 or 15 codes

---

## C.7 Mapping scheme for Burst Type 2 and K<sub>Cell</sub>=6 Midambles

m1	m2	m3	m4	m5	m6	
1	0	0	0	0	0	1 or 7 or 13 codes
0	1	0	0	0	0	2 or 8 or 14 codes
0	0	1	0	0	0	3 or 9 or 15 codes
0	0	0	1	0	0	4 or 10 or 16 codes
0	0	0	0	1	0	5 or 11 codes
0	0	0	0	0	1	6 or 12 codes

---

## C.8 Mapping scheme for Burst Type 2 and K<sub>Cell</sub>=3 Midambles

m1	m2	m3	
1	0	0	1 or 4 or 7 or 10 or 13 or 16 codes
0	1	0	2 or 5 or 8 or 11 or 14 codes
0	0	1	3 or 6 or 9 or 12 or 15 codes

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## Annex D (normative):

### Signalling of the number of channelisation codes for the DL common midamble case for 1.28Mcps TDD

The following mapping schemes shall apply for the association between the number of channelisation codes employed in a timeslot and the use of a particular midamble shift in the DL common midamble case. In the following tables the presence of a particular midamble shift is indicated by '1'. Midamble shifts marked with '0' are left unused.

---

## D.1 Mapping scheme for K=16 Midambles

m1	m2	m3	m4	m5	m6	M7	M8	m9	m10	m11	m12	M13	m14	m15	m16	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 code
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 codes
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3 codes
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4 codes
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5 codes
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6 codes
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	7 codes
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8 codes
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	9 codes
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	10 codes
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	11 codes
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12 codes
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	13 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	14 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	16 codes

---

## D.2 Mapping scheme for K=14 Midambles

m1	m2	m3	m4	m5	m6	M7	M8	m9	m10	m11	m12	M13	m14		
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 or 15 code(s)
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2 or 16 codes
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3 codes
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4 codes
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	5 codes
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6 codes
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7 codes
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	8 codes
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	9 codes
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	10 codes
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	11 codes
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	12 codes
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	13 codes
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	14 codes

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### D.3 Mapping scheme for K=12 Midambles

m1	m2	m3	m4	m5	m6	M7	M8	m9	m10	m11	m12	
1	0	0	0	0	0	0	0	0	0	0	0	1 or 13 code(s)
0	1	0	0	0	0	0	0	0	0	0	0	2 or 14 codes
0	0	1	0	0	0	0	0	0	0	0	0	3 or 15 codes
0	0	0	1	0	0	0	0	0	0	0	0	4 or 16 codes
0	0	0	0	1	0	0	0	0	0	0	0	5 codes
0	0	0	0	0	1	0	0	0	0	0	0	6 codes
0	0	0	0	0	0	1	0	0	0	0	0	7 codes
0	0	0	0	0	0	0	1	0	0	0	0	8 codes
0	0	0	0	0	0	0	0	1	0	0	0	9 codes
0	0	0	0	0	0	0	0	0	1	0	0	10 codes
0	0	0	0	0	0	0	0	0	0	1	0	11 codes
0	0	0	0	0	0	0	0	0	0	0	1	12 codes

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### D.4 Mapping scheme for K=10 Midambles

m1	m2	m3	m4	m5	m6	M7	M8	m9	m10	
1	0	0	0	0	0	0	0	0	0	1 or 11 code(s)
0	1	0	0	0	0	0	0	0	0	2 or 12 codes
0	0	1	0	0	0	0	0	0	0	3 or 13 codes
0	0	0	1	0	0	0	0	0	0	4 or 14 codes
0	0	0	0	1	0	0	0	0	0	5 or 15 codes
0	0	0	0	0	1	0	0	0	0	6 or 16 codes
0	0	0	0	0	0	0	1	0	0	7 codes
0	0	0	0	0	0	0	0	1	0	8 codes
0	0	0	0	0	0	0	0	0	1	9 codes
0	0	0	0	0	0	0	0	0	1	10 codes

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### D.5 Mapping scheme for K=8 Midambles

m1	m2	m3	m4	m5	m6	m7	m8	
1	0	0	0	0	0	0	0	1 or 9 code(s)
0	1	0	0	0	0	0	0	2 or 10 codes
0	0	1	0	0	0	0	0	3 or 11 codes
0	0	0	1	0	0	0	0	4 or 12 codes
0	0	0	0	1	0	0	0	5 or 13 codes
0	0	0	0	0	1	0	0	6 or 14 codes
0	0	0	0	0	0	1	0	7 or 15 codes
0	0	0	0	0	0	0	1	8 or 16 codes

---

### D.6 Mapping scheme for K=6 Midambles

m1	m2	m3	m4	m5	m6	
1	0	0	0	0	0	1 or 7 or 13 code(s)
0	1	0	0	0	0	2 or 8 or 14 codes
0	0	1	0	0	0	3 or 9 or 15 codes
0	0	0	1	0	0	4 or 10 or 16 codes
0	0	0	0	1	0	5 or 11 codes
0	0	0	0	0	1	6 or 12 codes

---

## D.7 Mapping scheme for K=4 Midambles

m1	m2	m3	m4	
1	0	0	0	1 or 5 or 9 or 13 code(s)
0	1	0	0	2 or 6 or 10 or 14 codes
0	0	1	0	3 or 7 or 11 or 15 codes
0	0	0	1	4 or 8 or 12 or 16 codes

---

## D.8 Mapping scheme for K=2 Midambles

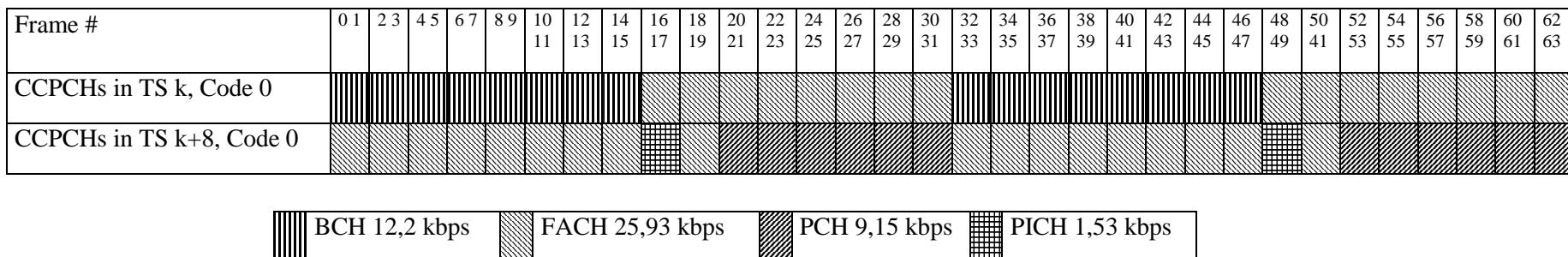
m1	m2	
1	0	1 or 3 or 5 or 7 or 9 or 11 or 13 or 15 code(s)
0	1	2 or 4 or 6 or 8 or 10 or 12 or 14 or 16 codes

---

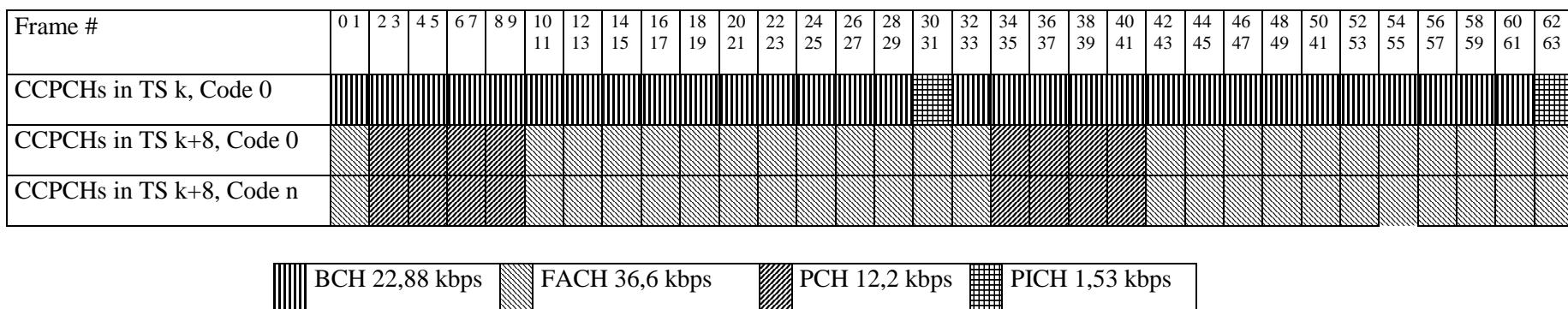
## Annex E (informative): CCPCH Multiframe Structure for the 3.84 Mcps option

In the following figures C.1 to C.3 some examples for Multiframe Structures on Primary and Secondary CCPCH are given. The figures show the placement of Common Transport Channels on the Common Control Physical Channels. Additional S-CCPCH capacity can be allocated on other codes and timeslots of course, e.g. FACH capacity is related to overall cell capacity and can be configured according to the actual needs. Channel capacities in the annex are derived using bursts with long midambles (Burst format 1). Every TrCH-box in the figures is assumed to be valid for two frames (see row 'Frame #'), i.e. the transport channels in CCPCHs have an interleaving time of 20msec.

The actual CCPCH Multiframe Scheme used in the cell is described and broadcast on BCH. Thus the system information structure has its roots in this particular transport channel and allocations of other Common Channels can be handled this way, i.e. by pointing from BCH.



**Figure C.1: Example for a multiframe structure for CCPCHs and PICH that is repeated every 64th frame**



**Figure C.2: Example for a multiframe structure for CCPCHs and PICH that is repeated every 64th frame, n=1...7**

## Annex F (informative): CCPCH Multiframe Structure for the 1.28 Mcps option

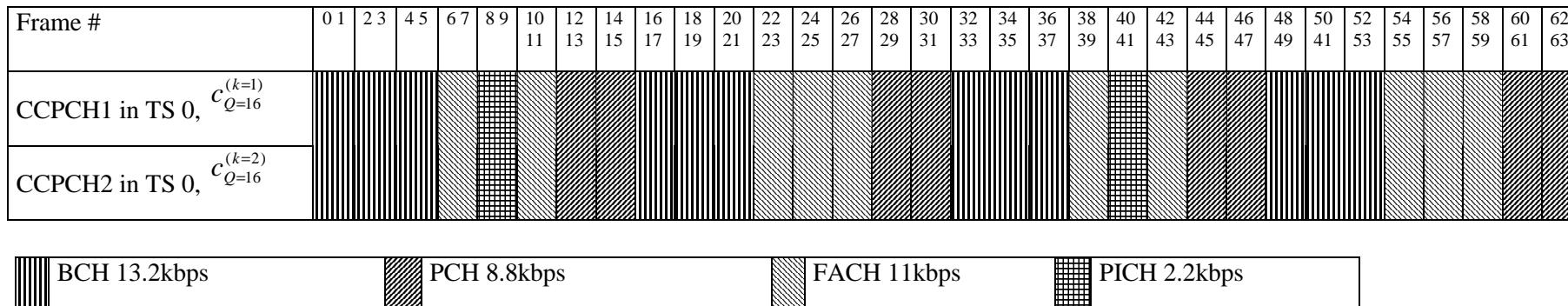


Figure F.1: Example for a multiframe structure for CCPCHs and PICH that is repeated every 64th frame (128 sub-frame)

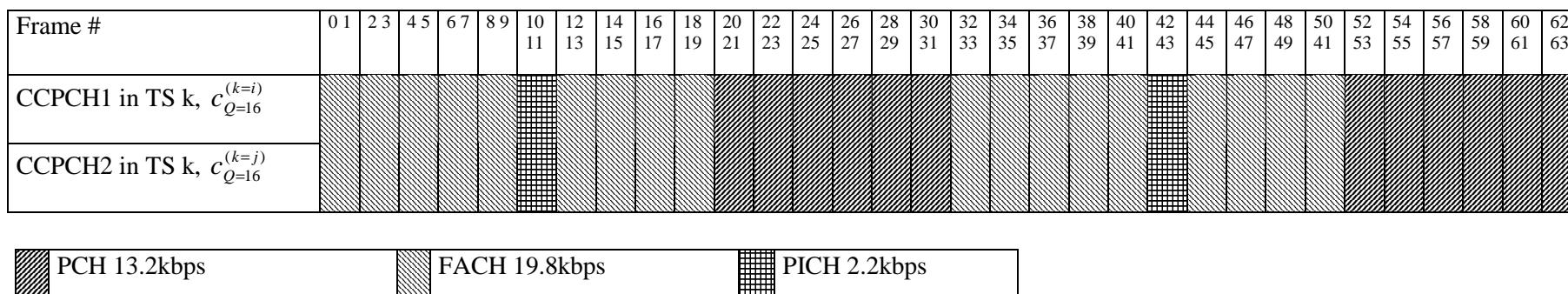


Figure F.2: Example for a multiframe structure for S-CCPCHs and PICH that is repeated every 64th frame, i,j=1...16 (i≠j),k≠0, 1,(128 sub-frame)

## Annex G (informative): Examples of the association of DL TPC commands to UL uplink time slots for 1.28 Mcps TDD

In the following two examples of the association of UL TPC commands to UL time slots and CCTrCHs are shown (see 6.2.2.2):

**Table G.1 Two examples of the association of DL TPC commands to UL uplink time slots with NULslot=3**

Case 1:  $N_{UL\_TPCsymbols}=2$ ; Case 2:  $N_{UL\_TPCsymbols}=4$

Sub-Frame Number	Case 1 (2 UL TPC symbols)		The order of the served UL time slot and CCTrCH pairs (UL time slot and CCTrCH number)	Case 2 (4 UL TPC symbols)	
	The order of UL TPC symbols			The order of UL TPC symbols	
SFN'=0	(1 <sup>st</sup> UL <sub>pos</sub> =0)	0	0 (TS3)	0	(1 <sup>st</sup> UL <sub>pos</sub> =0)
		1	1 (TS4) ←	1	
			2 (TS5) ←	2	
			0 (TS3) ←	3	
SFN'=1	(1 <sup>st</sup> UL <sub>pos</sub> =2)	0	0 (TS3) ←	0	(1 <sup>st</sup> UL <sub>pos</sub> =1)
		1	1 (TS4) ←	1	
			2 (TS5) ←	2	
			0 (TS3) ←	3	
			1 (TS4) ←		
SFN'=2	(1 <sup>st</sup> UL <sub>pos</sub> =1)	0	0 (TS3) ←	0	(1 <sup>st</sup> UL <sub>pos</sub> =2)
		1	1 (TS4) ←	1	
			2 (TS5) ←	2	
			0 (TS3) ←	3	
			1 (TS4) ←		
			2 (TS5) ←		
.	.	.	.	.	.

## Annex H (informative): Examples of the association of DL SS commands to UL uplink time slots

In the following two examples of the association of DL SS commands to UL uplink time slots are shown (see 6.2.2.3):

**Table H.1 Two examples of the association of DL SS commands to UL uplink time slots with  $N_{ULslot}=3$**

Case 1:  $N_{SSsymbols}=2$ ; Case 2:  $N_{SSsymbols}=4$

Sub-Frame Number	Case 1 (2 DL SS symbols)		The order of the served UL time slot (UL time slot number)	Case 2 (4 DL SS symbols)	
	The order of DL SS symbols			The order of DL SS symbols	
SFN'=0	(1 <sup>st</sup> $UL_{pos}=0$ )	0	0 (TS3)	0	(1 <sup>st</sup> $UL_{pos}=0$ )
		1	1 (TS4)	1	
			2 (TS5)	2	
			0 (TS3)	3	
SFN'=1	(1 <sup>st</sup> $UL_{pos}=2$ )	0	0 (TS3)	0	(1 <sup>st</sup> $UL_{pos}=1$ )
		1	1 (TS4)	1	
			2 (TS5)	2	
			0 (TS3)	3	
			1 (TS4)		
SFN'=2	(1 <sup>st</sup> $UL_{pos}=1$ )	0	0 (TS3)	0	(1 <sup>st</sup> $UL_{pos}=2$ )
		1	1 (TS4)	1	
			2 (TS5)	2	
			0 (TS3)	3	
			1 (TS4)		
			2 (TS5)		
.	.	.	.	.	.
.	.	.	.	.	.

## Annex I (informative): Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New	
14/01/00	RAN_05	RP-99591	-		Approved at TSG RAN #5 and placed under Change Control	-	3.0.0	
14/01/00	RAN_06	RP-99691	001	02	Primary and Secondary CCPCH in TDD	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99691	002	02	Removal of Superframe for TDD	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99691	006	-	Corrections to TS25.221	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99691	007	1	Clarifications for Spreading in UTRA TDD	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99691	008	-	Transmission of TFCI bits for TDD	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99691	009	-	Midamble Allocation in UTRA TDD	3.0.0	3.1.0	
14/01/00	RAN_06	RP-99690	010	-	Introduction of the timeslot formats to the TDD specifications	3.0.0	3.1.0	
14/01/00	-	-	-	-	Change history was added by the editor	3.1.0	3.1.1	
31/03/00	RAN_07	RP-000067	003	2	Cycling of cell parameters	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	011	-	Correction of Midamble Definition for TDD	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	012	-	Introduction of the timeslot formats for RACH to the TDD specifications	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	013	-	Paging Indicator Channel reference power	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	014	1	Removal of Synchronisation Case 3 in TDD	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	015	1	Signal Point Constellation	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	016	-	Association between Midambles and Channelisation Codes	3.1.1	3.2.0	
31/03/00	RAN_07	RP-000067	017	-	Removal of ODMA from the TDD specifications	3.1.1	3.2.0	
26/06/00	RAN_08	RP-000271	018	1	Removal of the reference to ODMA	3.2.0	3.3.0	
26/06/00	RAN_08	RP-000271	019	-	Editorial changes in transport channels section	3.2.0	3.3.0	
26/06/00	RAN_08	RP-000271	020	1	TPC transmission for TDD	3.2.0	3.3.0	
26/06/00	RAN_08	RP-000271	021	-	Editorial modification of 25.221	3.2.0	3.3.0	
26/06/00	RAN_08	RP-000271	023	-	Clarifications on TxDiversity for UTRA TDD	3.2.0	3.3.0	
26/06/00	RAN_08	RP-000271	024	-	Clarifications on PCH and PICH in UTRA TDD	3.2.0	3.3.0	
23/09/00	RAN_09	RP-000344	022	1	Correction to midamble generation in UTRA TDD	3.3.0	3.4.0	
23/09/00	RAN_09	RP-000344	026	2	Some corrections for TS25.221	3.3.0	3.4.0	
23/09/00	RAN_09	RP-000344	028	-	Terminology regarding the beacon function	3.3.0	3.4.0	
23/09/00	RAN_09	RP-000344	030	1	TDD Access Bursts for HOV	3.3.0	3.4.0	
23/09/00	RAN_09	RP-000344	031	1	Number of codes signalling for the DL common midamble case	3.3.0	3.4.0	
15/12/00	RAN_10	RP-000542	034	-	Correction on TFCI & TPC Transmission	3.4.0	3.5.0	
15/12/00	RAN_10	RP-000542	035	1	Clarifications on Midamble Associations	3.4.0	3.5.0	
15/12/00	RAN_10	RP-000542	036	-	Clarification on PICH power setting	3.4.0	3.5.0	
16/03/01	RAN_11	-	-	-	Approved as Release 4 specification (v4.0.0) at TSG RAN #11	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	033	2	Correction to SCH section	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	037	1	Bit Scrambling for TDD	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	039	1	Corrections of PUSCH and PDSCH	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	040	-	Alteration of SCH offsets to avoid overlapping Midamble	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	041	-	Clarifications & Corrections for TS25.221	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	045	1	Corrections on the PRACH and clarifications on the midamble generation and the behaviour in case of an invalid TFI combination on the DCHs	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	046	-	Clarification of TFCI transmission	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010062	048	-	Corrections to Table 5.b "Timeslot formats for the Uplink"	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010073	042	2	Introduction of the Physical Node B Synchronization Channel	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010071	043	1	Inclusion of 1.28Mcps TDD in TS 25.221	3.5.0	4.0.0	
16/03/01	RAN_11	RP-010072	044	-	Correction of beacon characteristics due to IPDLs	3.5.0	4.0.0	
15/06/01	RAN_12	RP-010336	051	-	Clarification of Midamble Usage in TS25.221	4.0.0	4.1.0	
15/06/01	RAN_12	RP-010336	053	-	Addition to the abbreviation list, correction of references to tables and figures	4.0.0	4.1.0	
15/06/01	RAN_12	RP-010342	049	-	Correction of spelling in definition of beacon characteristics	4.0.0	4.1.0	
15/06/01	RAN_12	RP-010342	055	-	Correction of Note for PDSCH signalling methods	4.0.0	4.1.0	
21/09/01	RAN_13	RP-010522	057	-	TFCI Terminology	4.1.0	4.2.0	
21/09/01	RAN_13	RP-010522	063	-	Clarification of notations in TS25.221 and TS25.223	4.1.0	4.2.0	
21/09/01	RAN_13	RP-010522	062	-	Addition and correction of the reference	4.1.0	4.2.0	
21/09/01	RAN_13	RP-010528	058	1	Corrections for TS 25.221	4.1.0	4.2.0	
14/12/01	RAN_14	RP-010741	065	1	Transmit Diversity for P-CCPCH and PICH	4.2.0	4.3.0	
14/12/01	RAN_14	RP-010741	067	-	Clarification of midamble transmit power in TS25.221	4.2.0	4.3.0	
14/12/01	RAN_14	RP-010746	059	-	Bit Scrambling for 1.28 Mcps TDD	4.2.0	4.3.0	
14/12/01	RAN_14	RP-010746	068	-	Transmit Diversity for P-CCPCH and PICH	4.2.0	4.3.0	
14/12/01	RAN_14	RP-010746	069	-	Corrections of reference numbers in TS 25.221	4.2.0	4.3.0	

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## History

<b>Document history</b>		
V4.0.0	March 2001	Publication
V4.1.0	June 2001	Publication
V4.2.0	September 2001	Publication
V4.3.0	December 2001	Publication